UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF ENGINEERING

ACADEMIC SESSION 2021/2022

UNDERGRADUATE HANDBOOK

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ABOUT US

Faculty of Engineering (FE) was formed on 1st July 2018, by merging 6 big faculties into one. With the transformation, Faculty of Engineering now comprises six schools namely School of Biomedical Engineering and Health Sciences, School of Chemical and Energy Engineering, School of Civil Engineering, School of Computing and School of Electrical Engineering. This transformation strengthens the collaboration of expertise with different engineering backgrounds within the faculty.

VISION
To be a premier global faculty in engineering and technology

MISSION
Synergizing academic capacity to nurture holistic talents and lead in innovative technologies.

MOTTO
Nurturing Talents. Delivering Excellence.

UNIVERSITI RANKING
UTM Is now ranked at #191 Globally : QS World University **Rankings 2021**. **Universiti Teknologi** Malaysia continues soaring high internationally when its performance improved to Top 15% in the Quacquarelly Symonds (QS) World University **Rankings 2021**, recently.

EDUCATIONAL GOALS

Bil.	Matlamat Pendidikan UTM
1	***Demonstrate knowledge and competency in various field of study, appropriate research and professional practices, and the processes of critical thinking, creative thinking, and problem solving for universal well-being and prosperity*** *Mempamerkan pengetahuan dan kemahiran dalam pelbagai bidang pengajian, amalan penyelidikan dan profesional yang bersesuaian serta proses-proses pemikiran kritis, pemikiran kreatif dan penyelesaian masalah untuk kemakmuran dan kesejahteraan sejagat*.
2	***Demonstrate high standard of ethical conduct, positive character, and societal responsibilities*** *Mempamerkan taraf etika yang tinggi, watak positif, dan tanggungjawab sosial*
3	***Appreciate and always be guided by the Universiti Teknologi Malaysia core values of Integrity, Synergy, Excellence and Sustainability*** *Menghayati dan sentiasa berpandukan nilai-nilai teras Universiti Teknologi Malaysia iaitu integriti, sinergi, kecemerlangan dan kelestarian*
4	***Communicate and collaborate effectively with other professionals, and the society*** *Berkomunikasi dan bekerjasama secara berkesan dengan ahli profesional yang lain serta masyarakat*
5	***Demonstrate the ability to learn and grow profesionally and further contribute to the development of science, technology and engineering*** *Menunjukkan keupayaan untuk belajar dan meningkat secara profesional dan seterusnya menyumbang kepada pembangunan sains, teknologi dan kejuruteraan*

MESSAGE FROM THE DEAN

Faculty of Engineering (FE), also known as UTM Engineering is currently accommodating more than 10,000 undergraduate and postgraduate students, and therefore has become one of renowned institutions in Malaysia to provide professional and engineering workforce to the market, making UTM proud to be the premier engineering university.

Faculty of Engineering has more than 700 engineering specialists in various engineering fields of Civil, Electrical, Chemical, Mechanical, Biomedical and Computing. With this broad expertise, FE aims to build a borderless future particularly in providing knowledge across multi-disciplines to address contemporary global challenges.

With this strength, FE is determined to continue to be a leading academic excellence institution based on the mission and vision of the faculty along with the slogan of “Nurturing Talent, Delivering Excellence”.

As well all know, the presence of unexpected Covid-19 pandemic has contributed to disruptive life-changing situation, particularly in the delivery of our teaching and learning since 2020. During this uncertainty period, FE is managing with our best mechanisms to continually provide teaching and learning activities through multiple learning platforms and pedagogies to accommodate with the new normal.

Finally, let us engineer the future through meaningful collaboration together for the benefit of our nation.

Professor Ts. Dr. Ruzairi bin Abdul Rahim
Dean, Faculty of Engineering,
Universiti Teknologi Malaysia

ORGANISATION STRUCTURE

UNDERGRADUATE STUDY

ENTRY REQUIREMENTS

BACHELOR'S DEGREE

For Malaysian Students

General Entry Requirements:

1. A pass in Malaysian Certificate of Education (SPM) or equivalent with a credit in Bahasa Melayu/Bahasa Malaysia or a credit in Bahasa Melayu/Bahasa Malaysia (July paper), **and**
2. Having Diploma or equivalent qualification recognized by the Malaysian Government, **or**
3. A pass in Malaysian Higher School Certificate (STPM) with at least C grade (CGPA 2.00) in General Paper and C grade (CGPA 2.00) in any two of the taken subjects in the STPM, **or**
4. A pass in Malaysian Matriculation Certificate / Foundation with minimum CGPA of 2.00, **or**
5. Hold A – Level / International Baccalaureate / Australian Matriculation (Ausmat) Certificate.
6. Attained a minimum Band 2 in Malaysian University English Test (MUET)/ Band 5.5 in IELTS/ Score of 500 in TOEFL PBT/ Score of 59 in TOEFL IBT.

Special Requirements for the Programme

1. Comply to university general requirements, **and**
2. Comply to special requirements for the programme.
   Please refer to *admission.utm.my/undergraduate-malaysian/* for further details.
3. Do not have any physical disabilities

For International Students

General Entry Requirements:

1. Passed General Certificate of Education (GCE), 'A' Level, Diploma in related field or other equivalent pre-university examinations; **or**
2. Any other certificate that is recognized by Senat of the University equivalent to the above; **or**
3. Participate in the bridging program organized by the university, **and**
4. Pass the English Proficiency requirements.
5. Pass the Health requirements.

Please refer to *admission.utm.my/entry-requirements-ug-international/* for further details.

Note: - Year of entry and duration of study will be based on the credit exemptions or credit transfer awarded by the university.

English Language Requirement for International Students

If English is not your native language and you are attending a school where English is not the language of instruction, you must take the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System Academic (IELTS Academic)

Applicants who do not meet the English proficiency requirements of their chosen programme at Universiti Teknologi Malaysia (UTM) can improve their English at Intensive English Programme (IEP) at Language Academy, UTM or CIEP at ELS Language Centers in Malaysia. UTM accepts IELTS Level 5.5 and above upon completion of IEP conducted by Language Academy, UTM or ELS English Certificate (level 107) as an ENGLISH LANGUAGE ENTRY REQUIREMENTS FOR INTERNATIONAL STUDENTS. Students who choose to attend IEP (Language Academy, UTM) must attain IELTS 5.5 or attend ELS and must pass the required English course(s) before starting their programmes in UTM

COURSE REGISTRATION

It is mandatory for all students who have registered for a programme – a full time or external candidate – to register every course that will be taken for the semester. Students who did not enroll in the programme will not be allowed to register for any course.

Students can only register for courses that are offered for a particular semester based on the regulations set by the student's faculty. Students cannot register for any course that is not offered in the semester.

Student can withdraw (TD) any course registered for the semester. Application to withdraw must be made by using the Course Withdrawal Form (UTM.E/3-2).

If student fails to do the registration or does not do the registration of courses within the specified duration as mentioned above, unless valid reasons are given, he or she will be dismissed from the University.

ACADEMIC TRANSCRIPT
Applications will be charged a fee of RM25.00 for each Master and PhD. Transcripts released in English and student were enrolled on year 2000 onwards.

ACADEMIC TRANSCRIPT
Applications will be charged a fee of RM25.00 for each Master and PhD. Transcripts released in English and student were enrolled on year 2000 onwards.

AWARD REQUIREMENTS

Bachelor's Degree

- Attain a total of not less than 138 credit hours with a minimum CGPA of 2.0.
- Professional Skill Certificate (PSC)
  Compulsory:
  1. Talent and Competency Management
  2. English Communication Skills Graduating Students (ECS)
  3. Design Thinking for Entrepreneur

  Elective (Choose two only):
  1. Data Analytics for Organization
  2. Professional Ethics and Intergrity
  3. Construction Measurement (Mechanical & Electrical)
  4. OSHE for Engineering Industry and Laboratory
  5. OSHE for Construction Industry and Laboratory Works
  6. Quality Management for Built Environment and Engineering Professionals
  7. Safety and Health Officer Introductory Course

Cross-Campus Programme

Students are given the opportunity to enrol in a few courses in participating universities. The grades and credits obtained during this period are transferable.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

(i) The total number of credits allowed to be taken is between twelve (12) and eighteen (18) credits only.
(ii) The student should hold a minimum CGPA of 3.00 at the time of application.
(iii) The student is not a residence of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However, should the participating university provide accommodation, the student will need to pay accommodation fees.

Professional Skills Certificate (PSC)

Students must enrol in certificate programmes offered by the Centres of Excellence in the University and the School of Professional and Continuing Education (SPACE) as part of the award requirement:

- Students are required to enroll and pass FIVE (5) PSC courses, to be eligible to graduate.

SCHOOL OF BIOMEDICAL ENGINEERING AND HEALTH SCIENCES

MANAGEMENT TEAM

Position	Name
Chair	Dr. Ahmad Zahran Md. Khudzari zahran@biomedical.utm.my
Associate Chair (Quality and Strategy)	Assoc. Prof. Ir. Dr. Azli Yahya azli@fke.utm.my
Associate Chair (Facilities)	Dr. Maheza Irna Mohamad Salim maheza@biomedical.utm.my
Director (Biomedical Engineering)	Assoc. Prof. Ir. Dr. Tan Tian Swee tantianswee@biomedical.utm.my
Director (Clinical Sciences and Sports Technology)	Dr. Aizreena Azaman aizreena@biomedical.utm.my
Academic Manager	Ir. Ts. Dr. Asnida Abdul Wahab asnida@biomedical.utm.my
Undergraduate Program Coordinator (Biomedical Engineering)	Ts. Dr Muhammad Amir Asári amir-asari@biomedical.utm.my
Undergraduate Program Coordinator (Equine Management)	Dr. Fuziaton Baharudin fuziaton@utm.my
Postgraduate (Taught Course) Program Coordinator (Biomedical Engineering)	Dr. Siti Ruzita Mahmod sruzita@biomedical.utm.my
Postgraduate (Research) Program Coordinator	Dr. Izwyn Zulkapri izwyn@biomedical.utm.my

UNDERGRADUATE STUDY
BACHELOR OF ENGINEERING (BIOMEDICAL) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Engineering (Biomedical) with Honours is offered on a full-time basis. The full-time programme is offered only at the UTM Johor Bahru campus. Student enrolment for full-time programme is subjected to the student's entry qualifications and the duration of study is between four (4) to six (6) years.

The curriculum is planned based on a 2-semester per academic session. Generally, students are expected to undertake courses between twelve (12) to eighteen (18) credit hours per semester or equivalent for credit exemption. Assessment is based on coursework and final examinations given throughout the semester.

General Information

1. Awarding Institution	Universiti Teknologi Malaysia
2. Teaching Institution	Universiti Teknologi Malaysia
3. Programme Name	Bachelor of Engineering (Biomedical)
4. Final Award	Bachelor of Engineering (Biomedical) with Honours
5. Programme Code	SEBBH-01
6. Professional or Statutory Body of Accreditation	Malaysian Qualification Agency Engineering Accreditation Council
7. Language(s) of Instruction	English and Bahasa Melayu
8. Mode of Study (Conventional, distance learning, etc)	Conventional
9. Mode of operation (Franchise, self-govern, etc)	Self-governing
10. Study Scheme (Full Time/Part Time)	Full Time
11. Study Duration	Minimum: 4 years Maximum: 6 years

Course Classification

No	Classification	Credit Hours	Percentage
i.	University Courses a. General b. Language c. Co-Curriculum	12 8 3	16.7%
ii.	Faculty & Programme Core	106	76.8%
iii.	Programme Electives	9	6.5%
	Total	**138**	100%
A	Engineering Courses (a) Lecture/Project/Laboratory (b)Industrial Training (c) Final Year Project	 97 5 6	78.3%
	Total Credit Hours for Part A	**108**	
B	Related Courses (a) Applied Science/Mathematic/Computer (b) Management/Law/Humanities/Ethics/Economy (c) Language (d) Co-Curriculum	 15 4 8 3	21.7%
	Total Credit Hours for Part B	**30**	
	Total Credit Hours for Part A and B	**138**	100%
	Total Credit Hours to Graduate	138 credit hours	

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Biomedical engineers with competency to work in biomedical industry.
PEO2	Biomedical engineers with leadership positions in the biomedical engineering sector.
PEO3	Biomedical engineers embrace professional development through biomedical engineering practice and life-long learning.
PEO4	Biomedical engineers who conduct their professional work ethically and contribute towards societal responsibilities.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Apply knowledge of science and engineering fundamentals to the solution of complex biomedical engineering problems.
PLO2	Identify, formulate and solve complex biomedical engineering problems through structured literature research and scientific approach using first principles of mathematics, natural sciences and engineering sciences.
PLO3	Design solutions for complex biomedical engineering problems with consideration for public health and safety, cultural, societal, and environmental needs.
PLO4	Conduct investigation into complex Biomedical Engineering problems using research-based knowledge and methodology to provide scientific conclusions.
PLO5	Select and apply appropriate techniques, resources, and modern medical engineering and IT tools, to complex biomedical engineering activities, with an understanding of the limitations.
PLO6	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues to professional biomedical engineering practice.
PLO7	Understand the role of biomedical engineers in society regarding social, cultural, environmental and global responsibilities for sustainable development.
PLO8	Ability to evaluate and make appropriate professional decision by taking into account ethical principles, social and environmental responsibilities.
PLO9	Communicate effectively on complex engineering activities through written, oral, visual and graphical forms to colleagues and society at large.
PLO10	Develop leadership attributes and be committed in achieving common goals in multi-disciplinary setting using good team working skills.
PLO11	Ability to adapt with the latest development within the biomedical engineering field for life-long learning and continuous knowledge improvement.
PLO12	Demonstrate knowledge and understanding of management and financial aspects of biomedical engineering and develop entrepreneurship skills

Award Requirements

To graduate, students must:

- Attain a total of not less than 138 credit hours with a minimum CGPA of 2.0.
- Professional Skill Certificate (PSC) - **Three** compulsory courses and **two** elective courses.

Student Exchange Programme

Student Exchange programme is a programme which will allow the students to spend one or two semesters at universities abroad and take courses in a regular semester with credit transfer opportunities. Students are encouraged to study at universities partners all around the world.

Students who choose to undertake a Student Exchange programme will do so on an Exchange-basis, i.e. students study overseas at one of UTM's many partner universities for one or two semesters. In the student exchange programme, the student will study overseas at one of UTM's many partner universities which students usually entitled for tuition fees waiver depend on the available quotas.

The programme is open to the undergraduates with the following conditions:

(i) Registered as an active student at Universiti Teknologi Malaysia
(ii) Must complete at least one-semester study in UTM (one semester) and must NOT be in the last semester of study in UTM.
(iii) Have a grade point average of 3.0 or higher. The students with grade point average lower than 3.0 are required to provide UTM international with a supporting letter/approval letter from the respective faculty.

For detailed information, please refer to UTM international website at https://www.utm.my/international/

Study Abroad Programme

Student Abroad programme is a programme which will allow the students to spend one or two semesters at universities abroad and take courses in a regular semester with credit transfer opportunities. Students are encouraged to study at universities partners all around the world.

Students who choose to undertake a Study Abroad programme will study overseas at a non-partner university of their choice and need to pay tuition fees to the host university. The students apply to the host university with the assistance of the UTM International and will continue to pay the tuition fees to UTM.

The programme is open to the undergraduates with the following conditions:
(i) Registered as an active student at Universiti Teknologi Malaysia
(ii) Must complete at least one-semester study in UTM (one semester) and must NOT be in the last semester of study in UTM.

(iii) Have a grade point average of 3.0 or higher. The students with grade point average lower than 3.0 are required to provide UTM international with a supporting letter/approval letter from the respective faculty.

For detailed information, please refer to UTM international website at https://www.utm.my/international/

Course Menu

YEAR 1 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB 1012	Introduction to Biomedical Engineering	2	
SEBB 1513	Basic Anatomy and Physiology	3	
SEEU 1023	Circuit Theory	3	
SSCE 1693	Engineering Mathematics 1	3	
UHLB 1112	English Communication Skills	2	
UHMS 1172	Malaysian Dynamics (Local)	2	
UHLM 1012	Malay Language Communication 2 (International)		
UHMT 1012	Graduate Success Attributes	2	
TOTAL CREDIT HOURS		**17**	

YEAR 1 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB 1523	Advanced Anatomy and Physiology	3	SEBB 1513
SEBB 1313	Statics and Dynamics	3	
SEEU 1223	Digital Electronics	3	
SSCE 1793	Differential Equations	3	
UHIS 1012	Islamic and Asian Civilization (local)	2	
UHMS	Malaysian Studies (international)		

1022			
UHL* 1112	Elective of Foreign Language	2	
TOTAL CREDIT HOURS		**16**	

YEAR 2 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEEU 2073	Signals and Systems	3	
SEEU 1063	Electronic Devices	3	
UBSS 1032	Introduction to Entrepreneurship	2	
SEBB 2712	Laboratory 1	2	
SSCE 1993	Engineering Mathematics 2	3	SSCE 1693
UHLB 2122	Academic Communication Skills	2	UHLB 1112
SEBB 2033	Computer Programming for Biomedical Engineer	3	
TOTAL CREDIT HOURS		**18**	

YEAR 2 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
UKQ* 2**2	Elective of Service-Learning Co-Curriculum	2	
UHI* 2**2	Elective of Knowledge Enhancement	2	
UHM* 2**2	Elective of Generic Skill		
UHIT 2302	Science and Technology Thinking	2	
SEEU 2523	Electromagnetic Field Theory	3	SSCE 1993
SSCE 2193	Engineering Statistics	3	

SEEU 3133	System Modelling and Analysis	3	
SEBB 2513	Basic Rehabilitation	3	
TOTAL CREDIT HOURS		**18**	

YEAR 3 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEEU 3063	Electronic Circuits and Systems	3	SEEU 1063
SEEU 3533	Communication Principles	3	SEEU 2073
SEBB 3712	Laboratory 2	2	
SEBB 3313	Biomedical Materials	3	
SSCE 2393	Numerical Methods	3	
SEBB 3423	Clinical Engineering	3	UHLB 2122
TOTAL CREDIT HOURS		**17**	

YEAR 3 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB 3323	Solid Mechanics	3	
SEBB 3023	Biomedical Imaging	3	
SEBB 3722	Laboratory 3	2	
SEBB 3033	Microprocessor Systems	3	
SEBB 3043	Instrumentation and Measurement in Biomedical	3	
UHLB 3132	English for Professional Purposes	2	UHLB 2122
TOTAL CREDIT HOURS		**16**	

SHORT SEMESTER			
Code	**Courses**	**Credit**	**Pre-req**
SEBB 4915	Industrial Training (HW)	5	SEBB 3423
TOTAL CREDIT HOURS		**5**	

YEAR 4 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB 4313	Biomedical Systems Design	3	
SEBB 4413	Biochemistry for Biomedical Engineers	3	
SEBB 4712	Laboratory 4	2	
SEBB 4812	Project Part 1	2	
SEBB 4023	Biomedical Signal Processing	3	SEEU 2073
SEBB 4**3	Elective 1	3	
SEBB 5**3	PRISMS Elective 1		
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
TOTAL CREDIT HOURS		**17**	

YEAR 4 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
SEBB 4824	Project Part 2	4	SEBB 4812
SEBB 4**3	Elective 2	3	
SEBB 5**3	PRISMS Elective 2		
SEBB 4**3	Elective 3	3	
SEBB 5**3	PRISMS Elective 3		
SHAS 4542	Engineering Management	2	
SEBB 4032	Professional Biomedical Engineering Practice	2	
TOTAL CREDIT HOURS		**14**	

Elective Courses

Code	Courses	Credit	Pre-req
SEBB 4043	Biomedical Image Processing	3	
SEBB 4053	Biosystem Modelling	3	
SEBB 4063	Advanced Biomedical Signal Processing	3	SEBB 4023
SEBB 4073	Biosensor and Transducers	3	

SEBB 4083	Artificial Intelligence	3	
SEBB 4323	Biomedical Devices	3	
SEBB 4343	Cell and Tissue Engineering	3	
SEBB 4433	Biomedical Instrumentation Management	3	
SEBB 4513	Rehabilitation Engineering	3	SEBB 2513
SEBB 4113	Bio-Fabrication	3	
SEBB 4123	Bio-Material Characterization and Analysis	3	
SEBB 4133	Machining and Testing for Biomedical Engineer	3	
SEBB 4153	Electronic CAD Digital System Design	3	
SEBB 4163	Advance Computer Programming and Data Structure	3	
SEBB 5013	Diagnostic and Therapeutic Technology	3	
SEBB 5023	Advanced Biomedical Engineering	3	
SEBB 5043	Biomechanics	3	
SEBB 5003	Biomedical Measurement Technique	3	
SEBB 5033	Medical Informatics	3	
SEBB 5013	Diagnostic and Therapeutic Technology	3	

**Choose three (3) courses from this group.

Elective of Generic Skill Courses

Code	Courses	Credit	Pre-req
UHMT 2012	Leadership in Organization	2	
UHMS 2022	Critical and Creative Thinking	2	
UHMS 2032	The Human Side of Knowledge Management	2	
UHMS 2042	Development and Global Issues	2	
UHMT 2052	Guidance and Counselling	2	
UHMT 2062	Psychology of Adjustment	2	
UBSS 2072	Fundamental of Intellectual Property	2	
UBSS 2082	Law of Entrepreneur	2	
UBSS 2092	Entrepreneurship and Enterprise Development	2	

UBSS 2012	Social Entrepreneurship	2	
UHMS 2112	Engineering Communication	2	
UHMS 2122	Human Communication	2	
UHMT 2132	Professional Ethic	2	

Elective of Knowledge Enhancement Courses

Code	Courses	Credit	Pre-req
UHII 2012	Al-Qur'an and Human Civilization	2	
UHIT 2032	Life institution and Sustainable Development	2	
UHIZ 2042	Future Study	2	
UHIT 2052	Family Law	2	
UHIZ 2062	World Science	2	
UHIS 2072	Sustainable Economy	2	
UHIS 2082	Practices and Concept of Halal Management	2	
UHII 2092	Philosophy of Islamic Art	2	
UHII 2102	Islam and Health	2	
UHII 2132	Islamic Entrepreneurship	2	

Elective of Language Skills Courses

Code	Courses	Credit	Pre-req
UHLA 1112	Arabic Language	2	
UHLJ 1112	Japanese Language 1	2	
UHLC 1112	Mandarin Language 1	2	
UHLJ 1112	France Language	2	
UHLN 1112	Persian Language	2	

Total Credits Earned: 138

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

No	Code	Course	Credit Earned (JKD)	Credit Counted (JKK)	Tick (√) If Passed
BIOMEDICAL ENGINEERING COURSES					
1	SEBB 1012	Introduction to Biomedical Engineering	2	2	
2	SEBB 1513	Basic Anatomy and Physiology	3	3	
3	SEEU 1023	Circuit Theory	3	3	
4	SSCE 1693	Engineering Mathematics 1	3	3	
5	UHLB 1112	English Communication Skills	2	2	
6	UHMS 1172	Malaysian Dynamics (Local)	2	2	
7	UHLM 1012	Malay Language Communication 2 (International)			
8	UHMT 1012	Graduate Success Attributes	2	2	
9	SEBB 1523	Advanced Anatomy and Physiology	3	3	
10	SEBB 1313	Statics and Dynamics	3	3	
11	SEEU 1223	Digital Electronics	3	3	
12	SSCE 1793	Differential Equations	3	3	
13	UHIS 1012	Islamic and Asian Civilization (local)	2	2	
14	UHMS 1022	Malaysian Studies (international)			

15	UHL* 1112	Elective of Foreign Language	2	2	
16	SEEU 2073	Signals and Systems	3	3	
17	SEEU 1063	Electronic Devices	3	3	
18	UBSS 1032	Introduction to Entrepreneurship	2	2	
19	SEBB 2712	Laboratory 1	2	2	
20	SSCE 1993	Engineering Mathematics 2	3	3	
21	UHLB 2122	Academic Communication Skills	2	2	
22	SEBB 2033	Computer Programming for Biomedical Engineer	3	3	
23	UKQ* 2**2	Elective of Service Learning Co-Curriculum	2	2	
25	UHI* 2**2	Elective of Knowledge Enhancement	2	2	
27	UHM*2**2	Elective of Generic Skill			
28	UHIT 2302	Science and Technology Thinking	2	2	
29	SEEU 2523	Electromagnetic Field Theory	3	3	
30	SSCE 2193	Engineering Statistics	3	3	
31	SEEU 3133	System Modeling and Analysis	3	3	
32	SEBB 2513	Basic Rehabilitation	3	3	
33	SEEU 3063	Electronic Circuits and Systems	3	3	
34	SEEU 3533	Communication Principles	3	3	
35	SEBB 3712	Laboratory 2	2	2	
36	SEBB 3313	Biomedical Materials	3	3	
37	SSCE 2393	Numerical Methods	3	3	
38	SEBB 3423	Clinical Engineering	3	3	

39	SEBB 3323	Solid Mechanics	3	3	
40	SEBB 3023	Biomedical Imaging	3	3	
41	SEBB 3722	Laboratory 3	2	2	
42	SEBB 3033	Microprocessor Systems	3	3	
43	SEBB 3043	Instrumentation and Measurement in Biomedical	3	3	
44	UHLB 3132	English for Professional Purposes	2	2	
45	SEBB 4915	Industrial Training (HW)	5	HL	
46	SEBB 4313	Biomedical Systems Design	3	3	
47	SEBB 4413	Biochemistry for Biomedical Engineers	3	3	
48	SEBB 4712	Laboratory 4	2	2	
49	SEBB 4812	Project Part 1	2	2	
50	SEBB 4023	Biomedical Signal Processing	3	3	
51	SEBB 4**3	Elective 1	3	3	
	SEBB 5**3	PRISM Elective 1			
52	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
53	SEBB 4824	Project Part 2	4	4	
54	SEBB 4**3	Elective 2	3	3	
	SEBB 5**3	PRISM Elective 2			
55	SEBB 4**3	Elective 3	3	3	
	SEBB 5**3	PRISM Elective 3			
56	SHAS 4542	Engineering Management	2	2	
57	SEBB 4032	Professional Biomedical Engineering Practice	2	2	
TOTAL CREDIT TO GRADUATE (a + b + c)			**138**	**133**	

OTHER COMPULSORY COURSES			
Professional Skills Certificate (PSC) (UTMSPACE/ School) ● Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate. ● Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.			
Compulsory PSC Courses (Enrol all 3 courses)			
1	GLRB0010	Design Thinking For Entrepreneur	
2	GLRM0010	Talent and Competency Management	
3	GLRL0010	English Communications Skill For Graduating Students (ECS)	
Elective PSC Courses (Choose 2 only)			
1	GLRT0010	Data Analytics for Organization	
2	GLRM0020	Professional Ethics and Integrity	
3	GLRT0020	Construction Measurement (Mechanical & Electrical)	
4	GLRT0030	Oshe For Engineering Industry and Laboratory	
5	GLRT0040	Oshe For Construction Industry and Laboratory Works	
6	GLRT0050	Quality Management For Built Environment and Engineering Professionals	
7	GLRT0060	Safety and Health Officer Introductory Course	

COURSE SYNOPSIS

CORE COURSES

SEEU 1023 - Circuit Theory

This course introduces students to the basic laws, theorems and methods of DC and AC circuit analysis such as Ohms law, Kirchhoff Current and Voltage Laws, Thevenin and Norton theorems, concept of series and parallel circuits etc. Based on these, the students are expected to be able to solve variables in any given DC and AC electric circuits. With the knowledge learned, the student would be able to apply the basic laws, theorem and methods of analysis for solving various problems in circuit analysis with confidence.

SEEU 1223 - Digital Electronics

This course emphasizes on the design, analysis, planning and implementation of complex digital systems using programmable logic, with specific focus on programmable logic devices. In order to facilitate the learning process, computer-aided design (CAD) software is used throughout the course. Some practical or almost actual environment problems and solutions are provided. With the knowledge learned, the student would be able to analyze the counter and register circuits completely with confidence and design synchronous counters.

SEEU 2073 - Signals and Systems

This course introduces the students to the different types of signals and systems. Emphasis mainly will be on continuous signal. Signal representation in both the time (Fourier series) and frequency domain (Fourier and Laplace transform) will be discussed. The concept of transfer function is introduced and the applications of the Laplace transform (such as for the solution of differential equations, and circuit analysis) is presented. Finally, the use of Bode plot in filter design will be covered.

SEEU 1063 - Electronics Devices

This is the first course in the field of electronics. It consists of basic electronic devices such as the diode, the bipolar junction transistor, and the field effect transistor. Course content will include the devices' basic structure, biasing and basic applications. With the knowledge learned, the student would be able to apply the basic laws, theorem and methods of analysis for solving various basic biasing circuits using data sheet with confidence.

SEBB 2033 - Computer Programming Techniques for Biomedical Engineer

As a fundamental course, this course equips the students with theory and practice on problem solving techniques by using the structured approach. From this course, the student will be equipped with skills of programming to solve simple to moderate problems. The course covers the following: preprocessor directives, constants and variables, data types, input and output statements, text files, control structures: sequential, selection and loop, built-in and user-defined functions, one dimensional and two dimensional arrays.

SEEU 2523 - Electromagnetic Field Theory
This course introduces students to some major views and theories in the area of electrostatic, magnetostatics and electromagnetic fields. This elementary electromagnetic field theory is summarized in Maxwell's equations for static and time varying fields in integral and differential forms, and also a time domain analysis of wave propagation.

SEEU 3133 - System Modelling and Analysis
This course introduces the students to the fundamental ideas and definitions of control systems such as block diagrams, plants or processes, open loop and close loop control systems, transfer functions and transient and steady state responses. Students will be taught how to obtain mathematical models of actual physical systems such as electrical, mechanical, electromechanical and simple fluid flow systems in transfer function and state-space equation. Methods of system representation such as block diagram representation and signal flow graphs will be examined. The students will also be exposed to techniques of analysing control systems such as time domain analysis and stability. Finally, an introduction to the design and analysis of control systems using MATLAB will also be given.

SEEU 3063 - Electronic Circuits and System
This course introduces students to some major views and theories in amplifiers and its application. It will examine some key issues in basic definition, construction of analogue amplifiers, operational amplifiers and analogue system with special focus on analysis of transistor amplifiers through small signal equivalent circuits. This course also covers some topics in functional electronic circuits. The circuits are derived from a diverse electronic circuitry existed in many electronic instrumentations. The course will also provide practice in carrying out a computer simulation and modelling of the amplifier's circuits using PSPICE or MultiSim software. The function, the behaviour and the characteristics of the functional circuits are analysed.

SEEU 3533 - Communication Principles
This course introduces the students the basic principles of communication systems. The fundamental concepts of analogue modulation in particular amplitude and frequency modulations will be strongly emphasized. Topics include types of modulated waveforms, transmitter and receiver structures. The two most significant limitations on the performance of a communications system; bandwidth and noise will be discussed. The concept of sampling, quantization and line coding techniques in rendering an information signal to be compatible with a digital system are explained prior to the study of coded pulse modulation and pulse code modulation (PCM). The waveforms and spectral analysis of bandpass digital modulations are introduced. The system performance in terms of bit error rate (BER) will also be covered. Finally, multiplexing, a method to utilize the communication resource efficiently is studied where two techniques will be explored; time-division and frequency-division multiplexing.

SEBB 3033 - Microprocessor System
This course introduces the principles and applications of microprocessors. Topics emphasized are processor architecture in detail incorporation with HLL language and fundamentals of designing and implementing the embedded system. This course emphasizes on understanding the fundamentals of microprocessor operation, writing coherent and error-free

HLL programmes, and designing basic microprocessor-based circuits. With the knowledge learned, the student would be able to design microprocessor-based systems using HLL programmes completely.

SEBB 2712 - Laboratory 1

The course includes the experiments on basic electrical, electronic, signal processing, technical drawing and programming that are related to biomedical engineering. It exposes the students to some common electrical and electronic components, circuits and theorem such as Thevenin and Norton theorem, RLC circuits and MSI circuits. On the other hand, this teaching laboratory also provides the skill of programming for embedded system, digital signal processing in Matlab and technical drawing using software.

SEBB 3712 - Laboratory 2

The purpose of this course is to provide students with practical experience in using lab electrical instruments, equipment, analyse experimental results, read components data sheets, and develop report-writing skills. Minimum 10 experiments from participating third year laboratories included but not limited to Basic Electronic, instrumentation, Microcontroller, Neuroscience, Physio Therapy, Biomaterials and Biomechanics. The students should be able to improve their communication skills and team-working environment.

SEBB 3722 - Laboratory 3

The course provides students with the opportunity to integrate technical knowledge and generic skills attained in the earlier years. This is to be achieved within the context of a medical engineering project conducted in a small team (typically six students) under the supervision of an academic staff. Topics supplementing this course include Bioinstrumentation, Biomechanics and Biomaterial, Medical Imaging, Biomedical Signal Processing and Clinical engineering. The laboratory is conducted based on Conceive-Design-Implement-Operate (CDIO) in which students are required to solve real and complex engineering problem by collecting information and feedback from the end user, design suitable experimental procedures for their innovations, present their innovations and finally submit the report.

SEBB 4712 - Laboratory 4

This course involves experiments in many different areas of biomedical engineering including but not limited to Bioinstrumentation, Biomechanics & Biomaterials, Medical Imaging, Biomedical Signal Processing and Clinical Engineering. This laboratory session is conducted as a Problem-Based Learning (PBL) approach. The students are grouped into 4-5 students per a group, and they will be given problems to solve that require them to do pre-labs and conduct experiments within 4 weeks. The students are required to solve the given problems as a team, design suitable experimental procedures, conduct the experiments, present the problem solutions and submit a full formatted report.

SSCE 1693 - Engineering Mathematics 1

This course is about multivariable calculus of real and vector-valued functions. The basic theory of partial derivatives and multiple integrals of real functions with their applications are discussed. This theory is extended to vector valued functions to describe motion in space, directional derivatives, gradient, divergence and curl, line integrals, surface integrals and

volume integral. Related theorems, namely Green's Theorem, Stokes' Theorem and Gauss Divergence Theorem and their applications are discussed in detail.

SSCE 1793 - Differential Equations
This is an introductory course on differential equations. Topics include first order ordinary differential equations (ODEs), linear second order ODEs with constant coefficients, the Laplace transform and its inverse, Fourier series, and partial differential equations (PDEs). Students will learn how to classify and solve first order ODEs, use the techniques of undetermined coefficients, variation of parameters and the Laplace transform to solve ODEs with specified initial and boundary conditions, and use the technique of separation of variables to solve linear second order PDEs.

SSCE 1993 - Engineering Mathematics 2
This course is about multivariable calculus of real and vector-valued functions. The basic theory of partial derivatives and multiple integrals of real functions with their applications are discussed. This theory is extended to vector valued functions to describe motion in space, directional derivatives, gradient, divergence and curl, line integrals, surface integrals and volume integral. Related theorems, namely Green's Theorem, Stokes' Theorem and Gauss Divergence Theorem and their applications are discussed in detail.

SSCE 2193 - Engineering Statistics
This course begins with basic statistics, elementary probability theory and properties of probability distributions. Introduction to sampling distribution, point and interval estimation of parameters and hypothesis testing are also covered. Simple linear regression and one-way analysis of variance are also taught in this course. Students are also introduced to some nonparametric methods in analysing data.

SSCE 2393 - Numerical Methods
This course discuss problem solving using numerical methods that involve non-linear equations, systems of linear equation, interpolation and curve fitting, numerical differentiation and numerical integration, Eigen value problems, ordinary differential equations and partial differential equations.

SEBB 1513 - Basic Anatomy and Physiology
This course is a study of anatomical terminologies, body’s structures, orientation and physiological event of human body systems through lectures, models and diagrams. Knowledge in anatomy is fundamental in biomedical engineering programmes because it provides the pathway to integrate between the engineering technology and multiple related medical disciplines. Emphasis is placed on the most important systems of organs (respiration, heart and circulation, nervous system, digestion, secretion, skeleton and muscles, immune system, reproductive system and sensory organs). Each topic is preceded by some comments concerning evolution and/or embryology and a few topics in applied physiology will be presented. The content of the lectures is adapted to engineers, an emphasis is placed on medical terminology and the project component is mainly focusing on biomedical technology related to human physiology and structure. Even after graduation, knowledge in anatomy is

still applicable in many medical disciplines such as research and technology developments, medical technology consultancy, hospital management and health care industries.

SEBB 1012 - Introduction to Biomedical Engineering
This is a course specially designed to introduce biomedical and health science engineering and motivate students to understand the programme of biomedical engineering at UTM. This course introduces the programme offered and gives an opportunity for student to comprehend what they are entitled to for the next 4 years. It also gives an overview on how to cope with the university environment. Lastly, this course will facilitate the students to plan their career path towards a biomedical engineer.

SEBB 1523 - Advanced Anatomy And Physiology
This course is an advanced study of anatomical terminologies, body structures, orientation and physiological events of human body systems through lectures, models and diagrams. Knowledge in anatomy & physiology are fundamental in biomedical engineering programmes because it provides the pathway to integrate between the engineering technology and medical disciplines. Even after graduation, knowledge in anatomy & physiology can be applicable in many medical disciplines such as research and technology developments, medical technology consultancy, hospital management and health care industries.

SEBB 1313 - Statics and Dynamics
Mechanics & biology have always fascinated humankind. In Biomedical Engineering programmes, statics and dynamics are two basic important subjects to equip undergraduates with the necessary tools to solve bio-mechanic related problems. This course covers the concepts and principles of statics and dynamics that are applied in the biomedical field. Covered in the course will be explanations of point and rigid body behavior under static loads and during motion. Emphasis is placed on the importance of satisfying equilibrium, analysing structure, biomechanics of human joints, kinematics and kinetics of rigid bodies.

SEBB 2513 - Basic Rehabilitation
This course aims to introduce students to the basics of rehabilitation so that they can understand important rehabilitation concepts and issues in disability management, within the context of rehabilitation engineering. It will equip students with basic knowledge and skills for the application of science, technology and engineering to the design and development of assistive (adaptive) technology and rehabilitation techniques. It will provide students with an understanding of the nature of problems confronting people with disabilities and an ability to provide technical solutions for these problems.

SEBB 3313 - Biomedical Materials
This course provides an introduction to the fundamentals of and recent advances in biomedical materials. It covers a broad spectrum of biomedical materials which include metals, ceramics, polymers and composites. It takes an interdisciplinary approach to describing the chemistry and physics of materials, their biocompatibility, and the consequences of implantation of devices made of these materials into the human body. The course is also designed to familiarise students with failure of materials through fracture, fatigue, wear and corrosion.

SEBB 3323 - Solid Mechanics

The course provides students with the knowledge to determine the strength and stiffness of structures being used. The structures that will be studied in this course are bars, pins, bolts, shafts and beams and the types of applied loading are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. The students should also be able to use the acquired knowledge to solve real problems either coming from research problems, or from real-world biomedical problems.

SEBB 3023 - Biomedical Imaging

A course is for introducing and exposing students to the world of medical tomography. It focuses on physical, operation and signal formation of medical tomography techniques from various imaging modalities such as MRI, ultrasound, CT-scan, nuclear medicine and X-ray.

SEBB 3423 - Clinical Engineering

This course introduces students to major principles of clinical engineering as part of the preparation for industrial training. The scope of clinical engineering covers pre-market, market and post-market life-cycle of medical devices as well as risk and personnel management. These include procurement planning, incident investigation, equipment management, productivity, cost effectiveness, information systems integration, and patient safety activities. Students will also be exposed to the related law, standard and regulation for medical devices. Other than that, principle of medical devices will also be discussed in the course

SEBB 3043 - Instrumentation and Measurement In Biomedical

This course introduces students to biomedical measurement systems and biomedical instrumentation design. The architecture of electronic instruments used to measure physiological parameters is addressed, as well as the analysis of major process functions integrated in these instruments.

SEBB 4915 - Industrial Training (HW)

Industrial Training Programme is a compulsory component of the undergraduate curriculum at the Faculty of Biomedical & Health Science Engineering. Placements at the participating industries are structured for undergraduates in the third semester of their third year study. The industries where the students will be attached to during their training is listed in the supporting document (LI-CL). These industries cover all areas in Biomedical Engineering such as biomedical instrumentation and signal processing, clinical science and engineering, therapy and rehabilitation and biomechanics and biomaterial. The nature of jobs involved in the training includes designing, manufacturing, testing, maintaining, fabricating and etc.

SEBB 4812 - Project Part I

The aim of the Final Year Project (FYP) is to give students opportunity to apply the knowledge that they have gained while studying in FKBSK to solve practical engineering problems. By doing so, it is hoped that the students will gain knowledge and experience in solving problems

systematically thus when they graduate, they will be ready to work as reliable and productive engineers.

SEBB 4824 - Project Part II
This course is a continuation from SEBB 4812.Students must submit a project thesis and present it at the end of the semester. Grades will be given for both.

ELECTIVE COURSES

SEBB 4043 - Biomedical Image Processing
This course introduces students to introductory and intermediate levels of image processing techniques. The area of coverage would be the digitization process as a mean to acquire the digital image. Next would be the enhancement and restoration processes which are to improve the quality of the image for next stage processing. Both the spatial domain and frequency domain approaches will be covered. The next stage would be the segmentation process. This is an important step towards advanced level processing. Finally, the topic of compression and coding will be covered. MATLAB will be used extensively for better understanding. By adapting this knowledge, students will be able to develop essential technical skills in solving biomedical image problems with some degree of accuracy. It focuses on medical image processing of image obtained from the various imaging modalities such as MRI, ultrasound, CT-scan, nuclear medicine and X-ray.

SEBB 4053 - Biosystem Modelling
The objective of this course is to introduce students to the mathematical model, methods and their biological application, and model of subsystem in human body. This course introduces students to some major views and theories in modeling the subsystem in human body. It is almost impossible to cover all subsystems in human body. As guidance, topics may include: the maintenance of cell homeostasis, excitation and conduction in nerve fibers, synaptic transmission and the neuromuscular junction, properties of muscles, the lung - physical and mechanical aspects of respiration, volume and composition of body fluids - the kidney, the cardiovascular systems, the heart as a pump, neural control of the heart and circulation, and the autonomic nervous system. The course will also provide practice in carrying out a computer simulation and modeling of bio system using Matlab/Simulink/LabView software.

SEBB 4063 - Advanced Biomedical Signal Processing
This course presents two fundamental concepts of signal processing: linear systems and stochastic processes. Various estimation, detection and filtering methods are taught and demonstrated on biomedical signals. All methods will be developed to answer concrete question on specific biomedical signal such as ECG, EEG and etCO2. The focus of the course is a series of labs that provide practical experience in processing biomedical data, with examples from cardiology, neurology, respiratory and speech processing.

SEBB 4073 - Biosensors and Transducers
This course is intended to introduce the function of biosensor and a transducer in the medical electronics industry. An overview of biosensors and an in-depth and quantitative view of device design including fabrication technique. Discussion of the current state of the art biosensor to

enable continuation into advanced biosensor design and fabrication. Topics emphasize biomedical, bio-processing, military, environmental, food safety, and bio-security applications.

SEBB 4083 - Artificial Intelligence

This course introduces students to the fundamentals of two techniques of artificial intelligence (AI), namely, fuzzy logic and neural networks. Both techniques have been successfully applied by many industries in consumer products and industrial systems. Fuzzy logic offers flexibility in developing rule-based systems using natural language type of rules. Neural networks on the other hand, have strong generalization and discriminant properties and offera simple way of developing system models and function approximation. They are highly applicable for many pattern recognition applications. This course gives the students appropriate knowledge and skills to develop, design and analyze effectively these two AI techniques for practical problems with some degree of accuracy. The students will also be given a hands-on programming experience in developing fuzzy logic and neural networks system to effectively solve real world problems.

SEBB 4323 - Biomedical Devices

A biomedical device is a product which is used for medical purposes in patients, in diagnosis, therapy or surgery. It includes a wide range of products varying in complexity and application and sometimes categorized into either passive or active devices. Examples include tongue depressors, medical thermometers, blood sugar meters, total artificial hearts, joint replacement devices, fibrin scaffolds, stents and X-ray machines. The global market of biomedical devices reached roughly 209 billion US Dollar in 2006 and is expected to grow with an average annual rate of 6 - 9% through 2010. Due to its importance, this course will introduce to students some of the many types of devices that are currently being used in the medical field.

SEBB 4333 - Biological Inspired Devices

The course provides students with an overview of non-conventional engineering approaches is biology, and to show how these approaches can be used to design and develop better (simpler, more robust, energy-efficient) solutions, especially in the development of novel biomedical devices. The focus of the course will be mainly on the physical part (i.e. the structure and function) of organisms or parts of the organism, rather than the signal processing part. The students will practice on implementing bio-inspired mechanism in solving engineering problems.

SEBB 4343 - Cell and Tissue Engineering

Tissue engineering integrates principles of engineering and life sciences towards the fundamental understanding of structure-function relationships in normal and pathological tissues. The course will cover the introduction and fundamentals of tissue engineering, extracellular matrix, cells, biomaterials in tissue engineering, scaffold in tissue engineering, in vitro and in vivo strategies, clinical applications of tissue engineering and ethical and regulatory issues in tissue engineering

SEBB 4423 - Biomedical Informatics

The course provides the student with the basic theoretical knowledge and practical experience from the area of medical informatics and radiobiology. The medical informatics knowledge covers area of processing of medical data, fundamentals of medical information system design, computer-aided medical diagnostics, and telemedicine. The radiobiology covers the physics of radiation, application of radiation in diagnostic and therapeutic, and radiation safety.

SEBB 4513 - Rehabilitation Engineering

This course will focus on the principles and application of rehabilitation sciences & assistive technology from the rehabilitation engineering perspective. It aims to provide the students with in-depth understanding pertaining important issues in rehabilitation engineering and equip students with knowledge and skills for the application of science, technology and engineering to the design and development of assistive (adaptive) technology and rehabilitation systems. It will also provide students with an understanding of the nature of problems confronting people with disabilities and an ability to provide technical solutions for these problems. Interdisciplinary interaction and team working for optimal disability management will be stressed, with emphasis being given to the role of the rehabilitation engineering professional in the team.

SEBB 4523 - Sports Technology in Exercise Rehabilitation

The course provides fundamental concept of sports science, technology and exercise rehabilitation. It focuses on total fitness, the biomechanics of sports, common injuries that occur in sport and how to prevent it. The application of technology in the process in exercise rehabilitation, assessment of injury, sports massage and psychological aspect of injuries are also addressed.

SEBB 4433 - Biomedical Instrumentation Management

Healthcare technology management provide an overview of systematic process in which qualified health care professionals, typically clinical engineers, in partnership with other healthcare leaders, plan for and manage health technology assets to achieve the highest quality care at the best cost. It explains the basic concepts of managed care and describes the various types of health plan in operation today. This course will cover the strategic planning as well as technology assessment and facilities planning proceed with technology procurement and conclude with service or maintenance management.

SEBB 4113 - Bio-Fabrication

This subject provides the importance of additive manufacturing and its role in prototyping, development, transplant, implant and innovation of biomedical products. Different process technologies for additive manufacturing and bioprinting devices, systems, capabilities, materials and applications will be covered. It takes an interdisciplinary approach to describing the chemistry and physics of devices, materials, their compatibility, and the applications of additive manufacturing and machining of advanced materials in a wide range of applications of biomedical products.

SEBB 4123 - Bio-Material Characterization and Analysis

This course is intended to expose the students with the most important characterization instruments to analyze the physico-chemical properties of a biomaterial. A range of advanced techniques for the materials characterization analysis, including materials composition, surface morphological, thermal, spectroscopy and chromatography analyses are introduced by discussing the basic underlying principle and the analysis procedures. Several case studies and recording data are evaluated and analyzed to improve the student's understanding in selecting types of characterization instruments in analyzing a biomaterial. Depending on the availability and functionality of instruments, lab visits and demonstrations will be scheduled following the class.

SEBB 4133 - Machining and Testing for Biomedical Engineer

This course is designed for students to learn and experience the process of machining, testing and advance analysis. This course will be focusing on selected biomedical related parts and carry out course learning using conventional and advanced manufacturing techniques such as using 3D printed machine, and Computer Numerical Control (CNC) machining techniques. Once parts are manufactured, mechanical testing will be carried out using conventional and advanced method employing Universal Testing Machine (UTM) to determine mechanical properties of parts. Further analysis will also be done to corroborate findings with theoretical foundation of material.

SEBB 4153 - Electronic CAD Digital System Design

This course presents design methods to construct digital systems, including combinational circuit and sequential circuit. Topics include: (1) Computer-Aided Design (CAD) tools for design, (2) Hardware Description Languages (HDL) for simulation and synthesis, and (3) state machine specification, design, and simulation. In this course, some of the important features of HDL will be examined. The course will enable students to design, simulate, model and analyze digital designs. The dataflow, structural, and behavioral modeling techniques will be discussed and related to how they are used to design combinational and sequential circuits. The use of test benches to exercise and verify the correctness of hardware models will also be described. Practical experience is gained by implementing various designs on a prototype FPGA board.

SEBB 4163 - Advance Computer Programming and Data Structure

This course discusses programming problems, why they are problems, and the approach C++ has taken to solve such problems using object-oriented programming approach (OOP). From this course, the students will be equipped with skills of advanced C++ programming language to solve moderate to advanced problems that related with biomedical engineering or healthcare application using OOP approach. It will also cover some basic data structure such as list structure and tree structure. The course covers the following syllabus: Introduction to objects, fast recap of C language syntax, data abstraction, class and object implementation, object initialization and cleanup, function and operator overloading, constants, inline functions, inline functions, name controls, etc. This course covers hands-on tutorial to expose the students to some modern C++ Integrated Development Environment (IDE) for biomedical and healthcare application development. This course also applies the group design project. The students will be divided in groups to propose a group project to solve complex problems that

related with biomedical engineering or healthcare application. Before attending this course, the students should have prior knowledge in C programming language, number representation (binary, octal, hexadecimal, decimal), signed/unsigned number arithmetic (1's compliment and 2's compliment), and simple logic functions (AND, OR, XOR, NOT, etc).

SEBB 5003 - Biomedical Measurement Technique

This course provides the students a complete exposure of various recording mechanism and biomedical parameters measured for diagnostic application. Also introduces students to design biomedical measurement systems and biomedical instrumentation. The architecture of electronic instruments used to measure physiological parameters is addressed, as well as the analysis of major process functions integrated in these instruments.

SEBB 5023 - Advanced Biomedical Engineering

This course provides the students with the introduction to advanced technologies of biomedical engineering in the field of bioinstrumentation, biophysics, biomaterials and biomechanics. The impact of technologies on clinical research, rehabilitation engineering, and patient care will be dealt along with professional ethics. The course explores techniques for assessing current information practices, determining the information needs of health care providers and patients, developing interventions using biomedical technology, and evaluating the impact of those interventions.

SEBB 5033 - Medical Informatics

This course introduces and exposes the students to the organization of biomedical informatics, in terms of fundamentals and applications of biomedical informatics in healthcare. It ranges from data acquisition, decision making, cognitive science, computing, system design, standards, and ethics, to Electronic Health Record (EHR), imaging, information management, data retrieval, Patient Care and Monitoring, and Bioinformatics. Basic theory and applications will be exposed through teaching and discussion. Practical work in medical informatics will be introduced as part of individual and group assignments.

SEBB 5013 - Diagnostic and Therapeutic Technology

This course is designed to introduce students to Diagnostic and Therapeutic Technology and their respective details on the broad collection of various related equipment. At the end of the course, students are able to describe the diagnostic methods and therapeutic technologies used in growing healthcare fields and be able to design a simple diagnostic/ therapeutic method which can be used in healthcare environment, clinical and research.

SEBB 5043 - Biomechanics

This course provides the students with application of the principles of mechanics and the engineering techniques to the human body. The series of lectures explore the musculoskeletal system and highlights selected applications in the area of orthopaedics (gait analysis, joint replacement) and analysing the various forms of human movement.

UNDERGRADUATE STUDY
BACHELOR OF SCIENCE (EQUINE MANAGEMENT) WITH HONOURS

PROGRAMME SPECIFICATIONS

The equine industry in Malaysia has expanded into many fields of sport disciplines. It requires more experts with the knowledge of equine science, sports and management. Universiti Teknologi Malaysia (UTM) has appeared to be the first higher learning institution in Malaysia and South East Asia to offer a Bachelor of Science (Equine Management) with Honours program to fulfill the equine science and sports experts requirement in the country.

The curriculum structure in this program has considered the requirements and recommendations of the stakeholders, including the Malaysian Equine Council (MEM). The curriculum covers the theories and practices of the three major fields of equine science, equine management and equine sports. The students will be developed with communication skills, ethics, professionalism, leadership, and entrepreneurship related to the equine industry.

Classroom lectures, tutorials, hands-on field practicals, group discussions, and industrial training are the teaching and learning methods. Assessments are written and oral/practical tests, individual & group assignments with presentations, and final examinations at the end of the semesters.

General Information

1. Awarding Institution	Universiti Teknologi Malaysia
2. Teaching Institution	Universiti Teknologi Malaysia
3. Programme Name	Bachelor of Science (Equine Management) with Honours
4. Final Award	Bachelor of Science (Equine Management) with Honours
5. Programme Code	SEBQH-01
6. Professional or Statutory Body of Accreditation	Malaysian Qualification Agency
7. Language(s) of Instruction	English and Bahasa Melayu
8. Mode of Study (Conventional, distance learning, etc)	Conventional
9. Mode of operation (Franchise, self-govern, etc)	Self-governing
10. Study Scheme (Full Time/Part Time)	Full Time

11. Study Duration	Minimum: 4 years Maximum: 6 years

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses a. General b. Language c. Co-Curriculum	 12 8 3	17.8 %
ii.	Programme Core Courses	70	54.2 %
iii.	Programme Elective Courses	36	28.0 %
	Total	**129**	100 %
Total Credit Hours to Graduate		129 credit hours	

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Competent and have strong basic knowledge and skills in equine science, sports and management.
PEO2	Highly skilled and competitive in solving local and global equine industry problems creatively and innovatively with technology applications.
PEO3	Able to communicate effectively and work in groups by exhibiting leadership traits.
PEO4	Demonstrate professionalism among the equine industry network through ongoing involvement in local community activities.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Demonstrate comprehensive skills in equine science and management with in-depth technical and theoretical knowledge.
PLO2	Demonstrate intellectual abilities in applying knowledge in equine science and management using critical and analytical skills.
PLO3	Application of basic methods and procedures to solve a variety of complex problems related to equine science and management.
PLO4	Demonstrate the ability to collaborate with other individuals from a variety of backgrounds and fields.

PLO5	Communicate effectively in presenting ideas in writing and orally using a variety of coherent and structured presentation methods appropriate to the context of the audience.
PLO6	Application of information, media and technology to carry out learning and tasks.
PLO7	Utilize and combine numerical data and graphs in learning.
PLO8	Demonstrate responsibility and high leadership qualities in achieving a goal.
PLO9	Self-improvement through continuous learning and effective professional development.
PLO10	Demonstrate entrepreneurial skills in implementing equine related projects.
PLO11	Demonstrate professionalism and adhere to ethics in completing given tasks.

Award Requirements

To graduate, students must:

- Attain a total of not less than 129 credit hours with a minimum CGPA of 2.0.
- Pass Industrial Training course
- Complete all Professional Skills Certificate (PSC)

Cross-Campus Programme

Students are given the opportunity to enrol in a few courses in participating universities. The grades and credits obtained during this period are transferable.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

(i) The total number of credits allowed to be taken is between twelve (12) and eighteen (18) credits only.
(ii) The student should hold a minimum CGPA of 3.00 at the time of application.
(iii) The student is not a resident of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However, should the participating university provide accommodation, the student will need to pay accommodation fees.

Course Menu

YEAR 1 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEBQ 1013	Introduction to Equine Science and Industry	3	
SEBQ 1023	Introduction to Management	3	
SEBQ 1093	Basic Horse Handling	3	
SEBQ 1282	Practical Experience at Equine Farm I: Basic Horse Handling	2	
UHAS 1172	Malaysian Dynamics (Local)	2	
ULA* 1112	Elective Foreign Language (Malaysian)	2	
ULAM 2112	Malay Language Communication (International)		
UHLB 1112	English Communication Skills	2	
TOTAL CREDIT HOURS		**17**	

YEAR 1 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
SEBQ 1102	Sports Psychology	2	
SEBQ 1112	Foundation of Equine Performance	2	
SEBQ 1203	Equine Anatomy and Physiology	3	
SEBQ 1033	Farm and Stable Management	3	
SEBQ 1292	Practical Experience at Equine Farm II: Basic Riding Skills	2	
UICI 1012	Islamic and Asian Civilization (TITAS) – Local	2	
UHMT 1022	Malaysian Studies (international)		
UHAK 1012	Graduate Success Attribute	2	
TOTAL CREDIT HOURS		**16**	

YEAR 2 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEBQ 2122	Horse Riding I: Endurance	2	SEBQ 1292
SEBQ 2213	Basic Equine Healthcare Management	3	
SEBQ 2043	Commercial Equine Facilities Design and Management	3	
SEBQ 2302	Practical Experience at Equine Farm III : Managing Horse Healthcare	2	
UHLB 2122	Advanced Academic English Skills	2	
UKQ*2**2	Co-curriculum and Service Learning	2	
U*** 2**2	Innovation & Creativity Cluster (Choose 1 from several electives)	2	
TOTAL CREDIT HOURS		**16**	

YEAR 2 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
SEBQ 2053	Equine Business Management	3	
SEBQ 2062	Principles of Risk Management	2	
SEBQ 2133	Horse Behaviors and Training	3	
SEBQ 2142	Horse Riding II: Dressage	2	
SEBQ 2223	Equine Disease Management	3	
SEBQ 2312	Practical Experience at Equine Farm IV:(Horse Husbandry Practices)	2	
UHIT 2302	Sciences and Technology Thinking	2	
TOTAL CREDIT HOURS		**17**	

YEAR 3 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEBQ 3243	Equine Nutrition	3	SEBQ 4482
SEBQ 3233	Equine Lameness and Conditioning	3	
SEBQ 3152	Horse Riding III: Jumping	2	
SEBQ 3302	Research Methodology	2	
SEBQ 3322	Practical Experience at Equine Farm V: Riding for Disable (Volunteer Helper)	2	
UBBS 1032	Introduction to Entrepreneurship	2	
TOTAL CREDIT HOURS		**14**	

YEAR 3 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
SEBQ 3073	Event and Competition Management	3	
SEBQ 3183	Equestrian Motion Analysis	3	
SEBQ 3263	Equine Biosecurity (Equine Quarantine)	3	
SEBQ 3332	Practical Experience at Equine Farm VI: Riding for Disable (Senior Helper Level)	2	
UHLB 3132	Professional Communication Skills (pre-req UHLB 2122)	2	
TOTAL CREDIT HOURS		**13**	

SHORT SEMESTER			
Code	**Courses**	**Credit**	**Pre-req**
SEBQ 4368	Industrial Training	8	
TOTAL CREDIT HOURS		**8**	

YEAR 4 (SEMESTER 1)			
Code	**Courses**	**Credit**	**Pre-req**
SEBQ 4082	Equine Seminar	2	
SEBQ 4102	Undergraduate Project 1	2	
SEBQ 4163	Riding Instructor Training	3	
SEBQ 4173	Equine Evaluation and Selection	3	
SEBQ 4193	Equine for Disabled	3	
SEBQ 4342	Practical Experience at Equine Farm VII: Riding Instructor	2	
TOTAL CREDIT HOURS		**15**	

YEAR 4 (SEMESTER 2)			
Code	**Courses**	**Credit**	**Pre-req**
SEBQ 4253	Equine Therapy and Rehabilitation	3	
SEBQ 4273	Equine Reproduction and Breeding Technologies	3	
SEBQ 4352	Practical Experience at Equine Farm VIII: Horsemanship	2	
SEBQ 4114	Undergraduate Project 2	4	
UKQE 3001	Extracurricular Experiential Learning (ExCEL)	1	
TOTAL CREDIT HOURS		**13**	

Elective Courses

Code	Courses	Credit	Pre-req
SEBQ 1023	Introduction to Management	3	
SEBQ 1102	Sport Psychology	2	
SEBQ 1122	Foundation of Equine Performance	2	
SEBQ 1292	Practical Experience at Equine Farm II – Advance Horse Handling	2	
SEBQ 3302	Research Methodology	2	
SEBQ 2053	Equine Business Management	3	
SEBQ 2062	Principle of Risk Management	2	
SEBQ 2223	Equine Disease Management	3	
SEBQ 2312	Practical Experience at Equine Farm IV – Horse Welfare, Hygiene & Podiatry.	2	
SEBQ 3073	Event and Competition Management	3	
SEBQ 3332	Practical Experience at Equine Farm IV – Horse Welfare, Hygiene & Podiatry.	2	
SEBQ 4082	Equine Seminar	2	
SEBQ 4163	Rider Instructor Training	3	
SEBQ 4173	Equine Evaluation & Selection	3	
SEBQ 4342	Practical Experience at Equine Farm VII – Riding Instructor Training	2	

- All elective courses are compulsory.

Elective of Language Skills Courses

Code	Courses	Credit	Pre-req
UHLA 1112	Arabic Language	2	
UHLJ 1112	Japanese Language 1	2	
UHLC 1112	Mandarin Language 1	2	
UHLJ 1112	France Language	2	
UHLN 1112	Persian Language	2	

Total Credits Earned: 129

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the courses will not be conferred a degree.

No	Code	Course	Credit Earned (JKD)	Credit Counted (JKK)	Tick (√) If Passed
CORE COURSES					
1	SEBQ 1013	Introduction to Equine Science and Industry	3	3	
2	SEBQ 1023	Introduction to Management	3	~~2~~	
3	SEBQ 1093	Basic Horse Handling	3	3	
4	SEBQ 1282	Practical Experience at Equine Farm I: Basic Horse Handling	2	2	
5	UHAS 1172	Malaysian Dynamics (Local)	2	2	
6	ULA* 1112	Elective Foreign Language (Malaysian)	2	2	
7	ULAM 2112	Malay Language Communication (International)			
8	UHLB 1112	English Communication Skills	2	2	
9	SEBQ 1102	Sport Psychology	2	2	
10	SEBQ 1112	Foundation of Equine Performance	2	2	
11	SEBQ 1203	Equine Anatomy and Physiology	3	3	
12	SEBQ 1033	Farm and Stable Management	3	3	
13	SEBQ 1292	Practical Experience at Equine Farm II: Basic Riding Skills	2	2	
14	UICI 1012	Islamic and Asian Civilization (TITAS)	2	2	
15	UHAK 1022	Malaysian Studies (international)			
16	UHMT 1012	Graduate Success Attribute	2	2	
17	SEBQ 2122	Horse Riding I: Endurance	2	2	
18	SEBQ 2213	Basic Equine Healthcare Management	3	3	
19	SEBQ 2043	Commercial Equine Facilities Design and Management	3	3	
20	SEBQ 2302	Practical Experience at Equine Farm III : Managing Horse Healthcare	2	2	
21	UHLB 2122	Advanced Academic English Skills	2	2	
22	UKQ* 2**2	Co-curriculum and Service	2	2	

		Learning			
23	U*** 2**2	Innovation & Creativity Cluster	2	2	
24	SEBQ 2053	Equine Business Management	3	3	
25	SEBQ 2062	Principles of Risk Management	2	2	
26	SEBQ 2133	Horse Behaviors and Training	3	3	
27	SEBQ 2142	Horse Riding II: Dressage	2	2	
28	SEBQ 2223	Equine Disease Management	3	3	
29	SEBQ 2312	Practical Experience at Equine Farm IV: Horses' Husbandry Practices	2	2	
30	UHIT 2302	Sciences and Technology Thinking	2	2	
31	SEBQ 3243	Equine Nutrition	3	3	
32	SEBQ 3233	Equine Lameness and Conditioning	3	3	
33	SEBQ 3152	Horse Riding III: Jumping	2	2	
34	SEBQ 3322	Practical Experience V: Riding for Disable (Volunteer Helper Level)	2	2	
35	UBBS 1032	Introduction to Entrepreneurship	2	2	
36	SEBQ 3073	Event and Competition Management	3	3	
37	SEBQ 3183	Equestrian Motion Analysis	3	3	
38	SEBQ 3263	Equine Biosecurity	3	3	
39	SEBQ 3332	Practical Experience VI: Riding for Disable (Senior Helper Level)	2	2	
40	SEBQ 3132	Professional Communication Skills (pre-req UHLB 2122)	2	2	
41	SEBQ 4168	Industrial Training	8	8	
42	SEBQ 4082	Equine Seminar	2	2	
43	SEBQ 4102	Undergraduate Project 1	2	2	
44	SEBQ 4163	Riding Instructor	3	3	
45	SEBQ 4173	Equine Evaluation and Selection	3	3	
46	SEBQ 4193	Equine for Disabled	3	3	
47	SEBQ 4342	Practical Experience VII: Riding Instructor	2	2	
48	SEBQ 4253	Equine Therapy and Rehabilitation	3	3	
49	SEBQ 4273	Equine Reproduction and Breeding Technologies	3	3	
50	SEBQ 4352	Practical Experience VIII: Horsemanship	2	2	
51	SEBQ 4114	Undergraduate Project 2	4	4	
52	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	

TOTAL CREDIT TO GRADUATE (a + b + c)			**129**	**129**	
OTHER COMPULSORY COURSES				
Professional Skills Certificate (PSC) (UTMSPACE/ School) ● Students are required to enrol and pass THREE (3) PSC courses and TWO (2) elective courses, in order to be eligible to graduate. ● Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.				
Compulsory PSC Courses (Enrol all 3 courses)				
1	GLRB0010	Talent and Competency Management		
2	GLRL0010	English Communication Skills Graduating Students (ECS)		
3	GLRM0010	Design Thinking for Entrepreneur		
Elective PSC Courses (Choose 2 only)				
1	GLRT0010	Data Analytics for Organization		
2	GLRM0020	Professional Ethics and Integrity		
3	GLRT0060	Safety and Health Officer Introductory Course		

COURSE SYNOPSIS

CORE COURSES

SEBQ 1013 - Introduction to Equine Science and Industry

This course in general acts as an introduction to the student to get an overview of equine sports and industry. Students will learn the economic aspect of equine as well as the different entities that define the equine industries as a whole. Students will be able to evaluate and analyze the domestic equine industry in terms of its impact and economic performance.

SEBQ 1033 - Farm and Stable Management

This course is a continuation from SEBQ 1093 (Basic Horse Handling – Part 1) where the student will be introduced to the fundamental knowledge and skills necessary for daily care and maintenance of the horse. Topics include horse conformation, horse stable design, grassland management, horse feeding & watering, rug & blankets, clipping & trimming, manure & pest management, risk assessment & management, lunging, specialist care of the competition horse, and transporting a horse

SEBQ 1093 - Basic Horse Handling

This course is an introduction to the basic skills necessary for daily care and maintenance of the horse. Topics include safety, stall care, feeding, and basic nutrition, handling and restraint, equine emergencies and first aid, bandaging, basic medications, and trailer safety. Preventative health care, deworming and vaccination programs, and dental and farrier care are also introduced.

SEBQ 1203 - Equine Anatomy & Physiology

This course aims to build the knowledge and understanding of the mechanisms of energy metabolism and means of monitoring performance. This module also aims to understand and clearly define the anatomical features of the horse and develop the ability to identify the anatomy of the musculoskeletal system. The student will develop the ability to identify anatomical features and relate their structure to function. An in-depth understanding of equine physiology is vital when training horses to a high level whilst minimizing the risk of injury.

SEBQ 1282 - Practical Experience I: Basic Horse Handling

This course gives students the experience to apply the knowledge and skills necessary for basic horse handling such as the daily care and maintenance of the horse. Topics include the classification, identification, and confirmation of horses, activities related to the stable yard, grooming. In addition, this course also gave opportunities to students handling and leading the horses, etc.

SEBQ 2043 - Commercial Equine Facilities Design and Management

This course focuses on the various types of constructional design of commercial equine facilities. The students will be applying the knowledge about the property layout, construction options, equipment, hay production, pasture management, water and waste management, zoning requirements, environmental impact, legal obligations, and liabilities of the facilities.

SEBQ 2122 - Horse Riding 1 Endurance
The course focuses on the knowledge and development of basic skills in Endurance riding. Students will acquire knowledge and understanding which covers the aspect of the horse as well as the rider on the subject of Endurance riding. Students will develop the skills required to be able to conduct Endurance with a sound base of knowledge to reflect equine performance.

SEBQ 2133 - Horse Behaviour and Training
This aims to equip the students with the knowledge of basic horse behaviour and the factors that influence and motivate horses for agility and during training. Students will learn the communication and social behaviour of horses and how stress and genetic factors implicate behavioural problems in horses.

SEBQ 2142 - Horse Riding 2: Dressage
This course focuses on the knowledge and development of basic skills about Dressage (up to Novice level). Students will acquire knowledge and understanding which covers the aspect of the horse as well as the rider on the subject of Dressage (up to Novice level). Students will develop the skills required to be able to conduct Dressage with a sound base of knowledge to reflect equine performance (up to Novice level).

SEBQ 2213 - Equine Healthcare Management
This course provides students with the knowledge of basic equine health care that covers the fundamental aspects and assessment of the physical condition of the horse, routine care, feeding and exercise. Students will learn the routine health care, disease prevention management practices on horses which will contribute to equine health fitness and welfare.

SEBQ 2302 - Practical Experience III: Managing Horse Healthcare at Farm
This course aims to equip the students with the knowledge of basic equine healthcare that covers the fundamental aspects such as routine health examination, monitoring physical condition, schedule maintenance and care including feeding, welfare and exercise. Students will learn healthcare and routine preventive management practices on horses at farm. At the end of this course the students are able to conduct physical examinations on horses to determine the horse's health status and understand the need for good health management on horses at the farm.

SEBQ 3152 - Horse Riding 3: Jumping
This course focuses on the development of knowledge and basic skills about Show Jumping horse riding. Students will acquire knowledge and understanding which covers the aspect of the horse as well as the rider on the subject of the Show Jumping event. Students will develop the skills required to be able to conduct a Show Jumping event based on knowledge acquired which includes the preparation of obstacles, course design, and judging points. This course in general acts as an introduction to the student to get an overview of the equestrian discipline of Show Jumping.

SEBQ 3183 - Equestrian Motion Analysis
This course is to develop students' understanding of biomechanical factors influencing the athletic horse. The specific aims are to understand the relationship between equine anatomy, movement, and performance; and to develop understanding and practical skills in the methodologies for measuring biomechanical parameters. Students also will be able to analyze to evaluate equine performance within biomechanical parameters.

SEBQ 3233 - Equine Lameness and Conditioning
This course aims to expose the students with the principles of the evaluation and interpretation of lameness disorders of the fore-and hind limbs of horses at farm. The students will be taught on how to access the grade of lameness on the field. Understanding the predispose factors to the common lameness will be discuss other than a basic method of cleaning wound of injuries for lameness treatment in this course.

SEBQ 3243 - Equine Nutrition
The course aims are to build on knowledge gained within the horse management, to understand equine digestive anatomy and physiology and feeding management practice for maintenance, breeding, growth, performance and health. To develop knowledge of nutritional requirements in a wide variety of horses, feed evaluation and diet composition, to be able to formulate ration for horses based on the requirements and the environmental management of arable crops.

SEBQ 3263 - Equine Biosecurity
This course provides an understanding of the importance of biosecurity in effectively preventing and controlling the spread of disease at the horse premises. This course also aims to equip the student with the knowledge of equine quarantine for disease control at a farm and legal requirements on horse importation in Malaysia. The topics will cover the scope of biosecurity management at farms and facilities which contribute to equine healthcare and welfare.

SEBQ 3322 - Practical Experience V : Riding for Disabled (Volunteer Helper)
This course opens the opportunity for students to experience practical training in horseback therapy for the disabled. Students will practice the knowledge acquired in real-life situations and at the same time attain skills to handle and manage as volunteer helpers for the disabled during riding sessions. End of this subject students can get the Volunteer helper certification from RDA Malaysia.

SEBQ 4102 - Undergraduate Project 1
The aim of the Undergraduate Project 1 is to allow students to apply the knowledge they have gained to solve practical equine-related problems. In the project, students will gain knowledge and experience in solving equine-related problems systematically to be ready for a working environment. The student will develop the project proposal. This course will progress to SEBQ 4114.Students must prepare a proposal and present it in a mini seminar at the end of the semester.

SEBQ 4114 - Undergraduate Project 2

The Undergraduate Project aims to allow students to apply the knowledge they have gained while undergoing this program to solve practical equine-related problems. Students will gain knowledge and experience in solving complex equine-related problems systematically to be ready for the working environment. This course is a continuation of SEBQ 4102. Students must submit a hardbound thesis and present their project in a mini seminar at the end of the semester.

SEBQ 4193 - Equine for Disabled

This course aims to provide a student with the knowledge, concepts, principles, and theories involved in equine for the disabled. Several common disabilities can benefit from equine treatment such as Cerebral Palsy, Down syndrome, Brain Injury, Seizure Disorders, Autism, Autistic Spectrum Disorders, learning disabilities. Students will be exposed to practice the knowledge learned in real-life situations handling those with disabilities (RDA) in the activities.

SEBQ 4253 - Equine Therapy and Rehabilitation

This course provides an understanding of alternative therapy for rehabilitation of musculoskeletal injury commonly experienced by working horses in the field. The therapeutic methods discussed in this subject are those non-veterinary medicine approaches and can be practiced by the therapist. The scope of this course covers the therapeutic and rehabilitation techniques currently practiced in the market.

SEBQ 4273 - Equine Reproduction and Breeding Technologies

The course aims to develop the understanding of reproduction functional physiology in horses. The student shall be able to identify oestrus behavior among mares and stallions and stages of pregnancy in mares. The student will be exposed to the principles of breeding management and care for the pregnant mares and stud stallions.

SEBQ 4352 - Practical Experience VIII: Horsemanship

This course provides opportunities for students to experience practical training in equine farms or stable management. Students have the opportunity to practice the knowledge they have learned in real-life situations and at the same time learn more about the knowledge, skills, management of the farm, and the stable. In addition to providing a record of daily work in the industry, at the end of the course, students should prepare a written report and reflect on the industries that have been implemented.

SEBQ 4368 - Industrial Training

The course is open to opportunities for students to experience practical training in any institution or industry related to the field of equine. Students have the opportunity to practice the knowledge they have learned in real-life situations and at the same time learn more about the knowledge, skills, management, and technology of the industry. In addition to providing a record of daily work in the industry, at the end of the course, students should prepare a written report and reflect on the training industries that have been implemented.

ELECTIVE COURSES

Elective Courses

SEBQ 1023 - Introduction to Management
The aim of this course is to provide a general introduction in management to students whose field of study is not management, but whose careers are likely to have a significant managerial component. Students will be able to understand the concepts and language of management and to be aware of the relationships among all management disciplines. This course aims to provide you with an overview of the role of management thereby giving you an appreciation of the key issues associated with achieving purposeful activity within organizations.

SEBQ 1102 - Sport Psychology
This course aims to prepare students with the knowledge in sports psychology in relation to the equine industry. This course exposes the students on how psychological factors affect performance and how participation in equine sports and exercise affect psychological and physical factors. In addition, students are also able to discuss the instruction and training of psychological skills for performance improvement when applied or working with athletes, coaches, and parents regarding injury, rehabilitation, communication, team building, and career transitions.

SEBQ 1112 - Foundation of Equine Performance
The aim of this course is to further previous knowledge gained in other courses and recognize the qualities needed in a competition horse. This course also aims to develop an understanding on the foundation of equine performance in order to produce and sustain performance horses at a competitive level

SEBQ 1292 - Practical Experience at Equine Farm II – Advance Horse Handling
This course gives students to experience and apply the knowledge and skills necessary for daily care and maintenance of the horse. Topics include horse conformation, horse stable design, grassland management, horse feeding & watering, rug & blankets, clipping & trimming, manure & pest management, risk assessment & management, lunging, specialist care of the competition horse and transporting a horse.

SEBQ 2053 - Equine Business Management
This course aims to address the types of organization that require commercial managers within the Equine sector and the responsibilities that are fundamental to the role of a commercial manager. The course addresses the complexity of the equine market and the influence this will have on the strategic aims of a business or the entry to market of new business. The course also addresses the relevance of sustainability within a commercial context.

SEBQ 2062 - Principle of Risk Management
This course aims to prepare students the knowledge in risk management for equine industry. This course exposes the students with the principles of risk management, risk management strategies, identifying the risks, assessing the risks, and managing the risk that will occur in various parties such as riders, staffs, horse, equipment, facilities and managing the incidents. Students are also able to discuss about the issues related to managing the risk in equine industry.

SEBQ 2223 - Equine Diseases Management
This course aims to equip the student with the knowledge of equine diseases and the health management of horses. Students will be more knowledgeable and proficient at recognizing and managing some of the major health problems associated with equines. The emphasis of this course will be on preventive maintenance and necessary managerial practices needed to keep the equine health and welfare.

SEBQ 2312 - Practical Experience IV: Horse Husbandry Practices
The course aims to equip the students with the knowledge of basic horse husbandry management at farm that covers the fundamental aspects of good farm management practice, welfare, routine horse dental care, feeding, exercise and farriery. Upon completion of this course the students will be able to understand and perform good horse husbandry practices.

SEBQ 3302 - Research Methodology
This course introduces undergraduate students in education as an informal training in handling research. Basically, this course describes the nature of educational research and also introduces the steps in the research process. Relevant topics in this course include identification of research problems, ethical issues in conducting a research, the definition of research and importance of research in the field of education. This course also covers important characteristics of research mainly the research problems, questions and objectives, hypothesis testing and implementing a research, literature review, research design, sampling methods, research instruments (qualitative and quantitative), collecting and data administration, data analysis (qualitative and quantitative) including descriptive and inferential statistics. This course also provides students with necessary information and suggestions on how to put a research report together in a correct and efficient manner.

SEBQ 3073 - Event and Competition Management
The main aim of this course is to enable students to acquire general knowledge about event and competition management and to become familiar with management techniques and strategies required for the successful planning, promotion, implementation, and evaluation of special events with a special focus on case studies of equine-related events. This course requires students to organize an event (of no specific nature) as well as a competition since students must be given hands-on experience of organizing an event firsthand.

SEBQ 3332 - Practical Experience VI : Riding for Disabled (Senior Helper)
This course is to develop skills among the students on practical training in horseback therapy for the disabled. Students have the opportunity to practice the knowledge gained in real-life situations while acquiring the skills to handle and manage the therapy as senior helpers for

the disabled during riding sessions. End of this subject students can get the senior helper certification from RDA Malaysia

SEBQ 4082 - Equine Seminar
This course will equip students with the knowledge and skills to write articles related to organizing seminars on current issues in the field of equine science and equine management. The course contents cover the aspects of producing writing seminar papers or academic articles, poster presentation, present papers and discuss current issues in the field of equine in Malaysia and internationally.

SEBQ 4163 - Riding Instructor Training
This course is designed to aid the students who wish to take an instructional role in the industry. Students will gain knowledge on the coaching perspective, how to organize, conduct, demonstrate and evaluate the performance of the rider and the horse. Students will be able to do an assessment and provide solutions during their class lessons.

SEBQ 4173 - Equine Evaluation and Selection
This course aims to provide students with knowledge from the functional aspect of performance and anatomy, breed standards in the equine industry, components of judging various breeds, judging various disciplines. It also provides an ability for students to assessing equines market value such as understanding the market value, factors drives a horse's price, various horse price-ranges, better purchase decision

SEBQ 4342 - Practical Experience VII : Riding Instructor Training
This course will assist the students who wish to take an instructional/coaching role in the equine industry. Students will gain knowledge on the coaching perspective in terms of how to organize, conduct, demonstrate and evaluate the performance of the rider.

SCHOOL OF CHEMICAL AND ENERGY ENGINEERING

MANAGEMENT TEAM

Position	Name
Chair	Professor Dr. Mohd Ghazali Mohd Nawawi ghazalinawawi@utm.my 07-5535500
Associate Chair (Academic and Student Development)	Associate Professor Dr. Aznizam Abu Bakar aznizam@utm.my 07-5535508
Associate Chair (Research and Academic Staff)	Associate Professor Dr. Mohd Azizi Che Yunus r-azizi@utm.my 07-5535502
Associate Chair (Quality and Strategy)	Professor Dr. Mat Uzir Wahit r-uzir@utm.my 07-5536140
Associate Chair (Continuous Education and TNE)	Associate Professor Dr. Muhammad A. Manan r-muhammad@utm.my 07-5535892
Associate Chair (Facility)	Associate Professor Dr. Zainul Akmar Zakaria zainulakmar@utm.my 07-5535739
Director (Chemical Engineering)	Dr. Hajar Alias r-hajar@utm.my 07-5536343
Director (Bioprocess and Polymer Engineering)	Associate Prof. Dr. Dayang Norulfairuz Abang Zaidel dnorulfairuz@utm.my 07-5531506

Position	Name
Director (Energy Engineering)	Dr. Hasrinah Hasbullah hasrinah@utm.my 07-5535515
Director (Petroleum Engineering)	Associate Prof. Dr. Muhammad Noorul Anam Mohd Norddin anam@utm.my 07-5535514

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Perform competently in chemical/ petroleum/ bioprocess/ gas/ nuclear industries and become important contributors to national development.
PEO2	Become creative, innovative and adaptable engineers as leaders or team members in their organizations and society.
PEO3	Contribute professionally towards the environmental well-being and sustainable development

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Ability to apply knowledge of mathematics, natural science, engineering fundamentals, chemical/ petroleum/ bioprocess/ gas/ nuclear engineering principles to the solution of complex engineering problems.
PLO2	Ability to identify, formulate, conduct research literature, and analyze complex chemical/ petroleum/ bioprocess/ gas/ nuclear engineering problems using first principles of mathematics and engineering sciences.
PLO3	Ability to design solution for complex chemical/ petroleum/ bioprocess/ gas/ nuclear engineering problems and design system or process to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PLO4	Ability to conduct investigation of complex chemical/ petroleum/ bioprocess/ gas/ nuclear engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PLO5	Ability to inculcate modern computational techniques and tools complex chemical/ petroleum/ bioprocess/ gas/ nuclear which include prediction and modeling to solve complex engineering problem with an understanding of the limitations.
PLO6	Ability to responsibly act as well as respond to the societal health, safety, environment, legal and cultural issues that are relevant to the professional engineering practice.

PLO7	Ability to explain and evaluate the sustainability and impact of professional engineering work in the solution of complex chemical/ petroleum/ bioprocess/ gas/ nuclear engineering problems in societal and environmental contexts.
PLO8	Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PLO9	Ability to communicate effectively through written and oral modes to all levels of society
PLO10	Ability to work independently, and as a member or a leader in a team to manage project in a multi disciplinary environment.
PLO11	Ability to acquire knowledge and engage in independent and life-long learning.
PLO12	Ability to demonstrate knowledge of engineering management principles and entrepreneurial mindset to manage projects in multi-disciplinary environments.

BACHELOR OF CHEMICAL ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Chemical Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subject to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a two-semesters per academic session. Generally, students are expected to undertake courses equivalent to between twelve (12) to eighteen (18) credit hours per semester. Assessment is based on coursework and final examination given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Chemical Engineering with Honours	
4. Final Award			Bachelor of Chemical Engineering with Honours	
5. Programme Code			SETKH	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study			Conventional	
9. Mode of Operation			Self-govern	
10. Study Scheme			Full Time	
11. Study Duration			Minimum: 4 years Maximum: 6 years	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	14	-
Short	4	-	8	-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (a) General (b) Language (c) Entrepreneurship (d) Co-Curriculum	 11 8 2 2	16.5%
ii.	Faculty/Programme Core	107	77.0%
iii.	Programme Electives	9	6.5%
	Total	**139**	**100%**
A	Engineering Courses (a)Lecture/Project/Laboratory (b)Workshop/Field/Design Studio (c)Industrial Training (d)Final Year Project	 80 0 5 6	65.5%
Total Credit Hours for Part A		**91**	
B	Related Courses (a) Applied Science/Mathematics/ Computer (b) Management/Law/ Humanities/Ethics/Economy (c) Language (d)Co-Curriculum	 17 21 8 2	34.5%
Total Credit Hours for Part B		**48**	
Total Credit Hours for Part A and B		**139**	**100%**
Total Credit Hours to Graduate		**139 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 139 credit hours with a minimum CGPA of 2.0.
- Pass Industrial Training
- Complete all Professional Skills Certificate (PSC)
- Students from other approved programmes who wish to undertake a Minor in the programme must complete not less than 15 credit hours of specialized Chemical Engineering courses which from part of the core and/or electives of the programme, as listed in the minor programme list.

CROSS-CAMPUS PROGRAMME

Students are given the opportunity to enroll in a few courses in participating universities. The grades and credits obtained during this period are transferable (up to 1/3 of the total credits of the curriculum). Currently, there are four participating universities i.e. Universiti Teknologi Malaysia, Universiti Sains Malaysia, Universiti Malaya and Universiti Malaysia Sarawak.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

(i) The total number of credits allowed to be taken is between twelve (12) and sixteen (16) credits only.
(ii) The student should hold a minimum CGPA of 3.00 at the time of application.
(iii) The student is not a residence of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However, should the participating university provide accommodation, the student will need to pay accommodation fees

COURSE MENU

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETK 1511	Industrial Seminar & Profession	1	
SETK 1523	Introduction to Engineering	3	
SETK 1533	Introduction to Computer Programming	3	
SETK 1213	Statics @	3	
SETK 1111	Engineering Drawings	1	
SSCE 1693	Engineering Mathematics I@	3	
UHLB 1112	English Communication Skills	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**16**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETK 1123	Mass Balance*@	3	
SETK 1223	Thermodynamics@	3	
SSCE 1993	Engineering Mathematics II@	3	
SSCK 1623	Organic Chemistry for Engineering	3	
SSCK 1831	Organic Chemistry Practical	1	
UHIS 1022	Philosophy and Current Issues (for Local Students)	2	
UHLM 1012	Malay Language Communication 2 (for International Students)		
UHMT 1012	Graduate Success Attributes	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**33**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 1793	Differential Equations	3	
SETK 2133	Energy Balance*@	3	SETK 1123#
SETK 2233	Fluid Mechanics	3	
SETK 2243	Materials Engineering	3	
SETK 2711	Thermodynamics and Material Eng. Laboratory	1	
UHLB 2122	Academic Communication Skills	2	UHLB 1112
UBSS 1032	Introduction to Entrepreneurship	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**50**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETK 2253	Chemical Engineering Thermodynamics	3	SETK 1223
SETK 2313	Transport Processes*	3	SETK 2133#
SETK 2721	Fluid Mechanics Laboratory	1	
SETK 2543	Numerical Method & Optimization*	3	SETK 1533
SEEU 2003	Electrical Technology	3	
UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students Only)	2	
UHIS 1022 OR UHMS1182	Philosophy and Current Issues (for International Students) OR Appreciation Ethics and Civilizations (for International Students)		
UKQ* ***2	Co-Curriculum & Service Learning	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**67**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCK 1203	Analytical Chemistry for Engineering	3	
SSCK 1891	Analytical Chemistry Practical	1	
SETK 3263	Chemical Reaction Engineering	3	
SETK 3323	Separation Processes*	3	SETK 2313#
SETK 3413	Pollution Control Engineering	3	
SETK 3731	Pollution Control and Reaction Laboratory	1	
SETK 3552	Occupational Safety and Health in Industry	2	
UHIT 2302	The Thought of Science and Technology	2	
	TOTAL CREDIT	**18**	

	CUMULATIVE CREDITS	**85**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETK 3564	Process Control & Instrumentation*	4	SSCE 1793# SETK 3323 SETK 3263
SETK 3334	Unit Operation & Industrial Processes	4	SETK 2313#
SETK 3741	Separation Processes Laboratory I	1	SETK 3323
SETK 3812	Undergraduate Project I**	2	
SETK 3343	Engineering Economics and Project Management	3	
UHLB 3132	Professional Communication Skills	2	UHLB 2122
UHL* 1112	Foreign Language Elective	2	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**103**	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SETK 3915	Industrial Training	5	
	TOTAL CREDIT	**5**	
	CUMULATIVE CREDITS	**108**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETK 4143	Chemical Product Design	3	
SETK 4751	Process Control Laboratory	1	SETK 3564
SETK 4761	Separation Processes Laboratory II	1	SETK 3334
SETK 4153	Plant Design*	3	SETK 3564
SETK 4824	Undergraduate Project II**	4	SETK 3812#
SETK 4**3	Elective 1	3	
SET* 5**3	PRISMS Elective 1		
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**124**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETK 4573	Process Safety & Operability	3	
SETK 4834	Plant Design Project**	4	SETK 4153
SETK 4**3	Elective 2	3	
SET* 5**3	PRISMS Elective 2		
SETK 4**3	Elective 3	3	
SET* 5**3	PRISMS Elective 3		

U*** 2**2	Soft Skills Elective	2	
	TOTAL CREDIT	**15**	
	CUMULATIVE CREDITS	**139**	

Note: * - cornerstone course; ** - capstone course; @ - with tutorial
- must pass (at least with grade D+) for prerequisite course

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

*Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

Elective Courses-Streaming (Choose ONE Stream only)

Apart from the core course, students must also take 9 credits of elective course. Students are advised to choose one stream and take 3 courses from the same stream.

1. Energy Management
   - SETK 4113 Sustainable Energy Management
   - SETK 4123 Thermal Energy Management
   - SETK 4133 Energy Planning for Sustainable Development

2. Environment
   - SETK 4413 Waste Management
   - SETK 4423 Environmental Management
   - SETK 4433 Environmental Sustainability

3. Occupational Safety and Health
   - SETK 4513 OSH Legislations and Management
   - SETK 4523 Industrial Hygiene
   - SETK 4533 Human Factors in Process Industry

4. Polymer Science and Technology
   - SETK 4613 Fundamentals of Polymer
   - SETK 4623 Polymer Physics and Properties
   - SETK 4633 Polymer Rheology and Processing

5. Bioprocess Engineering
   - SETK 4643 Downstream Bioprocessing
   - SETK 4653 Pharma and Nutraceutical Engineering
   - SETK 4663 Food Process Engineering

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the courses are not allowed to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
CHEMICAL ENGINEERING COURSES					
1	SETK 1111	Engineering Drawing	1	1	
2	SETK 1213	Statics	3	3	
3	SETK 1511	Industrial Seminar & Profession	1	1	
4	SETK 1523	Introduction to Engineering	3	3	
5	SETK 1533	Introduction to Computer Programming	3	3	
6	SETK 1123	Mass Balance	3	3	
7	SETK 1223	Thermodynamics	3	3	
8	SETK 2133	Energy Balance	3	3	
9	SETK 2233	Fluid Mechanics	3	3	
10	SETK 2243	Material Engineering	3	3	
11	SETK 2711	Thermodynamics and Material Eng. Laboratory	1	1	
12	SETK 2253	Chemical Engineering Thermodynamics	3	3	
13	SETK 2313	Transport Processes	3	3	
14	SETK 2721	Fluid Mechanics Laboratory	1	1	
15	SETK 2543	Numerical Method & Optimization	3	3	
16	SEEU 2003	Electrical Technology	3	3	
17	SETK 3263	Chemical Reaction Engineering	3	3	
18	SETK 3323	Separation Processes	3	3	
19	SETK 3413	Pollution Control Engineering	3	3	
20	SETK 3731	Pollution Control and Reaction Laboratory	1	1	
21	SETK 3552	Occupational Safety and Health in Industry	2	2	
22	SETK 3334	Unit Operation & Industrial Processes	4	4	
23	SETK 3343	Engineering Economics and Project Management	3	3	
24	SETK 3564	Process Control & Instrumentation	4	4	

25	SETK 3741	Separation Process Laboratory I	1	1	
26	SETK 3812	Undergraduate Project I	2	2	
27	SETK 3915	Industrial Training	5	HL	
28	SETK 4143	Chemical Product Design	3	3	
29	SETK 4153	Plant Design	3	3	
30	SETK 4751	Process Control Laboratory	1	1	
31	SETK 4761	Separation Processes Laboratory II	1	1	
32	SETK 4824	Undergraduate Project II	4	4	
33	SETK 4573	Process Safety & Operability	3	3	
34	SETK 4834	Plant Design Project	4	4	
35	SETK 4**3	Elective 1	3	3	
	SET* 5**3	PRISMS Elective 1			
36	SETK 4**3	Elective 2	3	3	
	SET* 5**3	PRISMS Elective 2			
37	SETK 4**3	Elective 3	3	3	
	SET* 5**3	PRISMS Elective 3			
		TOTAL CREDIT OF CHEMICAL ENGINEERING COURSES (a)	99	94	
MATHEMATICS AND SCIENCE COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCK 1623	Organic Chemistry for Engineering	3	3	
5	SSCK 1831	Organic Chemistry Practical	1	1	
6	SSCK 1203	Analytical Chemistry for Engineering	3	3	
7	SSCK 1891	Analytical Chemistry Practical	1	1	
		TOTAL CREDIT OF MATHEMATICS & SCIENCE COURSES (b)	17	17	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHMS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			

2	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
Cluster 2: Generic Skills					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UBSS 1032	Introduction to Entrepreneurship	2	2	
3	U**2**2	Soft Skills Elective	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT 2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQ* 2**2	Co-Curriculum & Service Learning	2	2	
2	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHL* 1112	Elective of Foreign Language	2	2	
Cluster 6 : Entrepreneurial Skills					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**23**	**23**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**139**	**134**	

OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATE (PSC)

- **Students are required to enroll and pass FIVE (5) PSC courses, in order to be eligible to graduate.**
- **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**

COMPULSORY PSC COURSES (Enroll All 3 Courses)		
1	GLRB0010	Design Thinking for Entrepreneur
2	GLRM0010	Talent and Competency Management
3	GLRL0010	English Communication Skills for Graduating Students (ECS)
ELECTIVE PSC COURSE (Choose 2 Only)		
1	GLRT0010	Data Analytics for Organization
2	GLRM0020	Professional Ethics and Integrity

3	GLRT0020	Construction Measurement (Mechanical & Electrical)
4	GLRT0030	OSHE for Engineering Industry and Laboratory
5	GLRT0040	OSHE for Construction Industry and Laboratory Works
6	GLRT0050	Quality Management for Build Environment and Engineering Professionals
7	GLRT0060	Safety and Health Officer Introductory Course
		More elective courses to be added in future

COURSE SYNOPSIS

CORE COURSES

SETK 1111 - Engineering Drawing

This course introduces students to Computer Aided Drawing tools. The topics include Computer Aided Drawing, Computer Aided Command, Geometry, Geometry, Orthographic Drawing, Isometric Drawing, Sectional Drawing and Flowchart Drawing.

SETK 1213 - Statics

This course introduces students to the basic principles and concepts in mechanics. It will deal with the resultant and resolution of force(s) acting on a particle, the equilibrium of a particle, the effect of force(s) on a rigid body, how to replace a force system with an equivalent system and the equilibrium of rigid body. This course also includes the determination of centroid, analysis of structure and friction. At the end of the course, students should be able to demonstrate and apply the knowledge for solving various engineering problems.

SETK 1511 - Industrial Seminar and Profession

This course introduces students to the basic chemical engineering knowledge and working environment through workshops and seminars by respective personnel (experts, engineers, lectures, alumni, senior students etc.) and also industrial visit to various chemical plants in Malaysia. Students need to prepare learning portfolios which contain summaries and reflections of all the seminars, workshops and industrial visit that they have attended.

SETK 1523 - Introduction to Engineering

The objective of this course is to introduce engineering and prepare students for learning engineering to become an engineer of the future. This course serves to bridge pre-university education to university life and provide support for adjusting to learning and expectations in tertiary education. This introduction is made through a mix of lectures, student-centred activities and presentations. This course employs Cooperative Problem-based Learning (CPBL). Through CPBL, students are not only exposed to frontier chemical engineering related issues, but are also equipped with other important professional skills such as communication, critical thinking, problem solving and life-long learning. CPBL is utilized to inculcate SD among the first year engineering students in order to foster environmentally responsible behaviours and provide strong foundation for more sustainable societies.

SETK 1533 - Introduction to Computer Programming

The main objective of this course is to provide the students the foundation of programming skills as a tool for solving problems in chemical engineering. It helps students to feel justifiably confident of their ability to write small programs that allow them to accomplish useful goals. This course includes the coverage of basics and application of MATLAB software for solving simple arithmetic operations with arrays, two-dimensional plotting and programming using flow control commands with conditional statements and loops. With this foundation of basic programming skills, the course provides opportunities to explore advanced topics for solving complex chemical engineering problems.

SETK 1123 - Mass Balance
This course introduces students to the chemical engineering and chemical processes, process and the fundamental operations of chemical process equipment. It also provides students with the basic principles of chemical engineering material balances as well as calculation techniques to solve material balance problems for chemical process systems and equipment.

SETK 1223 - Thermodynamics
Thermodynamics is an important basic engineering course where concepts such as systems, boundaries, mass, heat, work and energy are introduced. These concepts are then related using the 1st and 2nd Law of Thermodynamics. In this course, the properties of common substances such as water, air and general working fluids are introduced using property tables and basic state equations. These concepts are applied in many engineering equipment, basic refrigeration and power cycles. Such basic concepts are vital because they form the fundamentals for future chemical engineering subjects.

SETK 2133 - Energy Balance
Prerequisite: SETK 1123 Mass Balance (pass with at least D+)
This course introduces students to the chemical engineering profession and the fundamental operations of chemical process equipment. It also provides students with the basic principles of chemical engineering energy balances as well as calculation techniques to solve the material and energy balance problems for chemical process systems and equipment.

SETK 2233 - Fluid Mechanics
The course introduces the fundamental principles underlying fluid behaviour, hydraulics, hydrodynamics, internal and external flows and its analysis of engineering applications for the design of simple hydraulic components such as pump and turbine. The course covers the physics of fluid, classification of flow, fluid statics, fluid dynamics, the application of Bernoulli, continuity, and momentum equations, friction flow in pipes includes the use of Moody chart, flow metering, pump, dimensional analysis and similarity.

SETK 2243 - Material Engineering
The first part of this course is the introductory Materials Engineering. Topics covered include classification of materials (metals, ceramics, polymers, composites, semiconductors, smart materials, nanomaterials, and biomaterials); atomic bonds; crystal structure; crystalline defects and solid solutions; and phase diagrams. Main emphasis is on metals because metals are structurally the simplest to characterise and a sound knowledge of structure-property relation of metals can be extended to the study of ceramics and polymers. The second part of the course deals with mechanics of materials. Topics covered include stress and deformation of members under axial loading and torsion in circular shafts.

SETK 2711 - Thermodynamics and Material Engineering Laboratory
This laboratory course contains 6 experiments that cover basic concepts in Thermodynamics and Strength of Materials. Laboratory experiments are designed for hands-on experiences to understand the engineering principles. The experiments' application includes First and Second Law of Thermodynamics, Properties of Pure Substances and Properties & Strength

of Materials. This course also emphasizes the technical writing aspect where all students' observations and arguments of each experiment must be reported in proper format.

SETK 2253 - Chemical Engineering Thermodynamics
Prerequisite: SETK 1223 Thermodynamics (taken)
This course introduces students to the chemical engineering thermodynamics theory and applications in the areas of volumetric properties of fluids, heat effects, thermodynamics properties of fluids, thermodynamics of solutions, and physical and chemical equilibria.

SETK 2313 - Transport Processes
Prerequisite: SETK 2133 Energy Balance (pass with at least D+)
This course introduces students to the basic principles and application of heat and mass transfer engineering. The understanding from this course will be useful for the better understanding in distillation, absorption, liquid-liquid extraction, membrane separation, leaching, evaporation and other chemical processes.

SETK 2543 - Numerical Method & Optimization
Prerequisite: SETK 1533 Introduction to Computer Programming (taken)
This course introduces students to some numerical techniques in solving problems that could not be solved analytically. Students will be exposed to the numerical solution for roots of equation, system of linear algebraic equations, curve fitting, ordinary differential equations, differentiation and integration problem. MATLAB programming language will be implemented with the intention of illustrating the nuances of the methods, and showing more realistically how the methods are applied for problem solving.

SETK 2721 - Fluid Mechanics Laboratory
The aim of this laboratory course is for students to conduct experiments in conjunction with the theory course SETK 2233 (Fluid Mechanics). There are a total of 9 experiments for this course where two of them (Bourdoun Tube pressure gauge and Toricelli's Law), students need to construct and set up on their own based on the fundamental knowledge and literature finding. Other experiments include the operation of flow measurement equipment (Venturi nozzle, pitot tube, orifice and nozzle), flow through a piping system to determine major and minor losses. The lab runs closely with the lectures' observation in such a way that experiments support the text covered in the classroom.

SETK 3263 - Chemical Reaction Engineering
This course introduces students to chemical reactor design and theories in the area of chemical reaction engineering with emphasis on homogeneous and heterogeneous reactions. It will examine some problems related to isothermal reaction, data analysis, multiple reactions and non-isothermal operations. Students will also work cooperatively on a computer assignment to expose them to solving problems using software packages such as PolyMath.

SETK 3323 - Separation Processes
Prerequisite: SETK 2313 Transport Processes (pass with at least D+)
This course introduces different types of unit operations involved in the chemical and other physical processing industries such as humidification, absorption, distillation, liquid-liquid

extraction and solid-liquid extraction (leaching). It also deals with the design of separation operations using mass transfer principles.

SETK 3413 - Pollution Control Engineering
This course introduces the cause, effect and method to control pollution from industries. The course covers the three major categories of industrial pollution: water pollution, air pollution and industrial waste management. In the first part, the course includes the source and types of water pollutants, environmental regulations pertaining to waste water discharge, and techniques to treat wastewater before discharging to the environment. The second part of the course covers the source and effect of air pollution, regulations requirements for air pollution control, technology to control air pollution emissions from industries. The third part covers the management of industrial waste that includes definition of scheduled waste, scheduled waste regulations, and technique to manage the waste.

SETK 3552 - Occupational Safety and Health in Industry
This course presents a basic knowledge of occupational safety and health (OSH) at work. In particular, it emphasises on current issues and best practices in OSH in Malaysia and the world, OSH legislations, methods of hazard identification, accident prevention concept and its implementation at workplace. At the end of this course, it is expected that the students will be able to appreciate the legal requirements, theoretical and practical aspects of OSH in industry and its impact on the surrounding public community.

SETK 3731 - Pollution Control and Reaction Laboratory
This laboratory course contains experiments that cover basic concepts in chemical reaction engineering and pollution control such as kinetic analysis of reaction, ambient air and water quality analysis. All experiments require students to apply fundamental laboratory techniques and skills as well as communication skills. Students, in group will demonstrate a mastery of laboratory techniques and clearly describe the qualitative and quantitative aspects of the experiments performed.

SETK 3334 - Unit Operation and Industrial Processes
Prerequisite: SETK 2313 Transport Processes (pass with at least D+)
This subject introduces different types of unit operations and separation processes involved in the chemical industries such as particle technology, crystallization, solid-liquid separation, drying and evaporation. All of the topic is illustrated by detailed examples and is accompanied by homework exercises.

SETK 3343 - Engineering Economics and Project Management
This is a two-in-one course covering both Engineering Economy and Project Management topics. Engineering economy is the application of economic factors and criteria to evaluate alternatives, considering the time value of money in order to make an economic decision. The engineering economy study involves computing a specific economic measure of worth for estimated cash flows over a specific period of time. Project Management is the art of planning, scheduling, and controlling of project activities to achieve performance, cost, and time objectives, for a given scope of work, while using resources efficiently and effectively.

SETK 3564 - Process Control & Instrumentation

Prerequisite: SSCE 1793 (pass with at least D+), SETK 3323 Separation Processes & SETK 3263 (taken)

This course covers the fundamentals of dynamic process modelling, dynamic process behaviours and process control. Although more concentration is given to lumped parameter systems modelling, distributed parameter systems are introduced. Feedback control system design, analysis and tuning are dealt with in detail. Also included are model estimation techniques for first order plus dead time (FOPDT) systems. Other commonly found control structures, such as feedforward, ratio, split-range and cascade control, and plant-wide control systems design are taught qualitatively. This course employs Active Learning (AL).

SETK 3741 - Separation Processes Laboratory I

Prerequisite: SETK 3323 Separation Processes (taken)

This subject introduces students to the equipment in the separation processes discussed in the Separation Processes course. This will give a 'hands-on' experience to the students on how to handle the unit operations and to interpret the data taken from the experiments. There are also various types of packing and plate in the column (absorption and distillation) that are being used in the laboratory. Comparison can be made on the efficiency of each packing/plate after all the packing/plate types have been used. This subject also demonstrates the basic principles of different types of unit operations involved in the chemical industries such as liquid-liquid extraction and heat exchanger. Students will be assessed through instructor's observation, peer evaluation and technical report submitted.

SETK 3812 - Undergraduate Project I

This course is a first stage of the Undergraduate Project which involves preliminary studies and planning on how to carry out the study that is given to the students. It is designed to expose the students on how to write a research proposal. It will emphasize on the research philosophy and research methodology. The works include literature review, writing a problem statement, scope identification, objectives and method determination. At the end of the course, students should be able to write a research proposal in a professional practice. The students should also be able to manage and plan their research according to the time given.

SETK 3915 - Industrial Training

This course is a core course which will assign students to industries, governments or semi-governments agencies and organizations for a period of 12 weeks. The training aims to expose students to real chemical engineering practices while enhancing their knowledge andworking experiences as well as improving their interpersonal skills. The students also have the opportunities to apply learned theories into real chemical engineering practices. Studentsare supervised by the school and industrial supervisors.

SETK 4143 - Chemical Product Design

This course offers a background understanding to design a chemical product using a computer-aided approach. This course introduces step by step in designing chemical products from market survey, problem formulation, establishing product needs, generating ideas to produce the targeted product, selecting among ideas and manufacturing of product. The lecture will apply the step by step of the product design using applicable case studies for

design of a product as well as enhance the understanding of the design process among students. The product is designed to meet the product specifications, environmental issues and also taking into consideration sustainable issues.

SETK 4153 - Plant Design

Prerequisite: SETK 3564 Process Control & Instrumentation (taken)

This course presents the principles and methodology for product and process design. In particular, it emphasises on the key elements of process design which include process synthesis, heat integration, equipment sizing and cost estimation and process optimisation in generating inherently safe, economic and environmentally friendly processes. The course features the use of process simulation tools.

SETK 4751 - Process Control Laboratory

Prerequisite: SETK 3564 Process Control & Instrumentation (taken)

This course exposes students to areas of process control systems in the chemical industry. It also teaches the students how to control the specific control variables through the use of simple PID control. Students will experience how to perform open loop and closed loop tuning methods for specific processes. Also included is the application of the PLC program to plan and control a simple process. Students will gain hands-on experience in process control through experiments that employ pilot-scale chemical processes.

SETK 4761 - Separation Processes Laboratory II

Prerequisite: SETK 3323 Separation Processes (taken)

This course introduces students to the equipment in the separation processes discussed in Separation Processes and Unit Operations and Industrial Processes courses. This will give a 'hands-on' experience to the students how to handle the unit operations and to interpret the data taken from the experiments. This laboratory covers particulate solid separation process, filtration, fluidized bed, spray drying, tray drying and evaporation experiments which will expose the students to the variety of the equipment that can be used in the chemical process industries. Students will be assessed through instructor's observation, peer evaluation and technical report submitted.

SETK 4824 - Undergraduate Project II

Prerequisite: SETK 3812 Undergraduate Project I (pass with at least D+)

This course is a second stage of the Undergraduate Project which involves doing experimental works / studies and discussing the results of the project. It is designed to expose the students to writing a research report. It will emphasize on the research philosophy and research methodology. The works include literature review, writing a problem statement, scope identification, objective, experimental work and discussing the results. At the end of the course, students should be able to write a thesis/ research report in a professional practice. The students should also be able to manage and plan their research according to the time given.

SETK 4573 - Process Safety & Operability

This course is intended to impart important insights on safety and operability of chemical plant operations. It reveals the current state of the art technology adopted by the process industries to deal with ever-increasing demand to make the plant safer, environmentally benign and profitable. Techniques to evaluate the adequateness of the layer of protection adopted by the process plant shall be mastered. The course also offers systematic methods for troubleshooting plausible root causes of operational problems and deciding appropriate corrective actions. It also features extensive use of project-based learning, discussions and oral presentations and written reports.

SETK 4834 - Plant Design Project

Prerequisite: SETK 4513 Plant Design (taken)

This project is aimed at equipping the students with the skills and creativity in designing a process plant in the absence of complete data. In particular, it emphasizes on the key elements of process design which include process creation/synthesis, process analysis, process evaluation and process optimization in generating inherently safe, economic and environmentally friendly processes. Students will acquire the skill for hands-on application and integration of the principles of chemical engineering required to design a process plant. Students will also learn the technique of writing a comprehensive technical plant design report.

ELECTIVE COURSES (STREAMING)

1. Energy Management

SETK 4113 - Sustainable Energy Management

This course presents the principles for a holistic approach for energy management in a company setting. It provides strategies and methodologies for setting up a sustainable energy management system in a company and for implementing state-of-the-art energy conservation measures using various analysis tools, involving various processes equipment for thermal energy as well as electrical energy systems.

SETK 4123 - Thermal Energy Management

This course presents the principles and a system approach methodology to analyse thermal energy systems in the industries. The course will cover the fundamentals of a typical industrial steam system, including steam generation, steam distribution, steam end-uses, condensate recovery and cogeneration system. This course also presents the key parameters and measurements, that are required to conduct the steam system evaluation. This course also introduces process integration to improve the energy efficiency of a thermal energy system.

SETK 4133 - Energy Planning for Sustainable Development

This course provides students with the ability to use EXCEL spreadsheet and Generalized Algebraic Modeling System (GAMS) as a tool for solving realistic energy issues. Students are expected to use basic and advanced features of Excel spreadsheet such as regression analysis, optimization calculations, matrix operations and more in depth functions and techniques such as VBA (Visual Basic for Applications) and macro programming as well as Excel's statistical functions and GAMS. Emphasis will be placed on the formulation of

mathematical models, solving and interpreting meaningful problems in engineering, science and business.

2. Environment

SETK 4413 - Waste Management
The course aims to analyse the components of solid and hazardous waste management. Upon completion of the course, students should be able to apply the concept of solid and hazardous waste management and identify the issue in waste management. The course covers the analysis of sources, generation and characteristics of industrial and municipal wastes, selection and evaluation of collection systems, handling and disposal practices of municipal wastes, management of scheduled wastes, the design of waste treatment systems and the pollution prevention and techniques.

SETK 4423 - Environmental Management
The course aims to provide knowledge and understanding on environmental management in Malaysia as well as to develop intellectual skills in environmental planning. In order to achieve this, the course is basically divided into two components which are the overview of environmental management in Malaysia and the sequence of environmental planning. Students will be taught on the methodology to carry out environmental impact assessment (EIA). Term projects for students to experience the stages involved in environmental planning

SETK 4433 - Environmental Sustainability
This course introduces students to issues of environmental sustainability. The course includes discussion on the fundamentals of environmental cycle, concept of sustainability, environmental consequences of coastal and inland developments. At the end of the course, students should be able to apply the knowledge by associating environmental problems that arise with poor management of environmentally sensitive areas. The students should be able to work in a team to demonstrate the project development practices related to the environmental enhancement.

3. Occupational Safety and Health

SETK 4513 - OSH Legislations and Management
This course presents the principles of OSH Legislations and Management. The course features extensive use of case studies from industry through group as well as individual project work.

SETK 4523 - Industrial Hygiene
This course covers the fundamentals of industrial hygiene, which in most countries including the UK, Commonwealth countries and Europe, is termed as occupational hygiene. Industrial hygiene is generally defined as the art and science dedicated to the anticipation, recognition, evaluation, communication and control of environmental stressors in, or arising from, the workplace that may result in injury, illness, impairment, or affect the well-being of workers and members of the community. The concept stems from construction, mining and manufacturing industries, and is particularly familiar among process industries. The course is started by

introducing the students to the industrial hygiene field of the area. Then different categories of hazards are covered so that students may understand the source of problems/hazards. Fugitive emission, which is the main source of background exposure to workers in process industries, is introduced to the students. Finally, the assessment and control measure of the hazards are also presented.

SETK 4533 - Human Factors in Process Industry
This course introduces a basic knowledge of human factors principles and the nature of human interaction with their physical work environment. The content of this course includes behaviours, cognitive, socio-technical systems, and the nature of human performance in the process industry.

4. Polymer Science and Technology

SETK 4613 - Fundamentals of Polymer
Basic terminologies, principles on polymers and structural relationship towards polymer classification are discussed. An overview on the polymer industry is elaborated together with its impact on human life. Molecular weight relationships toward polymer properties and its implication are briefly presented. This course emphasises specifically on the advance of polymer synthesis including step-growth, chain-growth and coordination polymerizations. Kinetic for the polymerization mechanism is described and its relationship to molecular weight is explained in detail. The limitations and application for each polymerization mechanism are discussed. The polymerization systems used for the polymerization process are discussed together with their advantages and the disadvantages. Finally, this course also exposed students to the pilot scale set-up of the polymerization systems.

SETK 4623 - Polymer Physics and Properties
This course is designed to expose students to the properties of polymers which have great importance. It will emphasize on the mechanical properties, electrical properties, chemical resistance, degradation effects and flammability properties, A strong emphasis will be given on the mechanical properties which include viscoelastic behavior, tensile, flexural and impact properties. Long term test using creep deformation is also included. At the end of the course the student should be able to explain the interrelation between polymer properties, structures and applications. The students should also be able to describe the appropriate test and characterization for each property.

SETK 4633 - Polymer Rheology and Processing
This course will discuss about Newtonian and non-Newtonian flow, pseudo-plastic, Bingham, dilatant and thixotropic behavior, origin of non-Newtonian flow. Students will be able to do Modelling of polymer melt flow-isothermal flow of Newtonian and power law fluids (drag and pressure flow) through different channels of uniform cross-section. This course will also cover topics such as measurement of flow properties, melt flow indexer, capillary viscometers, and cone and plate viscometer, characteristics and Rabinowitch correction. Students should be able to explain the application of rheological studies in polymer processing-extruder screw and die, analysis of pressure, drag and leakage flow, characterization and interaction of screw and die, balanced runner molding.

5. Bioprocess Engineering

SETK 4643 - Downstream Bioprocessing

The aim of the course is to provide an overview of the various downstream processes involved in the production of bio-products such as food, beverages, antibiotics, antiferons, vitamins, insulins, citric acid and others. The unique natures of biomolecules make their separation processes different from conventional chemical processes. In addition, the application of mass transfer, mass balances, and thermodynamics principles are combined with life sciences so as to develop, impart and vary the biotechnology purification techniques. The various bioseparation techniques include centrifugation, microfiltration, ultrafiltration, adsorption, chromatography, electrophoresis, and many more. Students will be tested in their ability to understand the subject based on the ability to answer tests, quizzes, tutorials, assignments and final examination. In addition, class presentation based on the project also will be carried out during the end of semester.

SETK 4653 - Pharma and Nutraceutical Engineering

This course introduces students to some aspects of pharmaceutical and nutraceutical engineering. Students will be exposed to the fundamental elements, including physicochemical and biopharmaceutical drugs formulation, drug delivery system, pharmaceutical microbiology and nutraceutical considerations. At the end of lectures, students will be able to understand the theory aspects and some applications in pharmaceutical and nutraceutical engineering. Students will be tested in their ability to answer during lecture class, tests, tutorials, assignments and final examination.

SETK 4663 - Food Process Engineering

This course introduces students to some major principles, concepts and applications in handling, processing and packaging of foods including the design of process equipment. The course will also provide practice in case studies, carrying out an industrial visit project to observe the application of knowledge in food industries and setting informative research on the business planning of selective food processing operations.

BACHELOR OF CHEMICAL ENGINEERING (BIOPROCESS) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Chemical Engineering (Bioprocess) with Honours is offered on a full-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subject to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a two semesters per academic session. Generally, students are expected to undertake courses equivalent to between twelve (12) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Chemical Engineering (Bioprocess) with Honours	
4. Final Award			Bachelor of Chemical Engineering (Bioprocess) with Honours	
5. Programme Code			SETBH	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study			Conventional	
9. Mode of Operation			Self-govern	
10. Study Scheme			Full Time	
11. Study Duration			Minimum : 4 years Maximum : 6 years	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	14	-
Short	4	-	8	-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (a) General (b) Language (c) Co-Curriculum	 13 8 2	 16.2%
ii.	School Core	65	45.8%
iii.	Programme Core	48	33.8%
iv.	Programme Electives	6	4.2%
	Total	**142**	**100%**
A	Engineering Courses (a) Lecture (b) Laboratory/Workshop (c) Industrial Training (d) Final Year Project	 71 7 5 10	 65.5%
Total Credit Hours for Part A		**93**	
B	Related Courses (a) Applied Science/Mathematic/ Computer (b) Management/Law/Humanities/Ethics/Economy (c) Co-Curriculum (d) Others	 26 12 2 9	 34.5%
Total Credit Hours for Part B		**49**	
Total Credit Hours for Part A and B		**142**	**100%**
Total Credit Hours to Graduate		**142 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 142 credit hours with a minimum CGPA of 2.0.
- Pass Industrial Training
- Complete all Professional Skills Certificate (PSC)

CROSS-CAMPUS PROGRAMME

Students are given the opportunity to enrol in a few courses in participating universities. The grades and credits obtained during this period are transferable (up to 1/3 of the total credits of the curriculum). Currently, there are four participating universities i.e. Universiti Teknologi Malaysia, Universiti Sains Malaysia, Universiti Malaya and Universiti Malaysia Sarawak.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

(i) The total number of credits allowed to be taken is between twelve (12) and sixteen (16) credits only.
(ii) The student should hold a minimum CGPA of 3.00 at the time of application.
(iii) The student is not a resident of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However, should the participating university provide accommodation, the student will need to pay accommodation fees.

COURSE MENU

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETB 1011	Industrial & Career Seminar	1	
SETB 1021	Engineering Drawing	1	
SETB 1023	Introduction to Chemical & Bioprocess Engineering	3	
SETB 1123	Statics & Biomaterial[@]	3	
SEEU 2003	Electrical Technology	3	
SSCE 1693	Engineering Mathematics I[@]	3	
UHLB 1112	English Communication Skills	2	
UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students Only)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation Ethics and Civilizations (for International Students)		
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**18**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETB 1113	Mass Balance*[@]	3	
SETB 2033	Thermodynamics[@]	3	
SETB 1133	Microbiology for Engineers	3	

SSCE 1993	Engineering Mathematics II[@]	3	SSCE 1693
UHIS 1022	Philosophy and Current Issues (for Local Students)	2	
UHLM 1012	Malay Language Communication 2 (for International Students)		
UHMT1012	Graduate Success Attributes	2	
UBSS 1032	Introduction to Entrepreneurship	2	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**36**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETB 2113	Introduction to Programming	3	
SETB 2123	Energy Balance*[@]	3	SETB 1113#
SETB 2043	Fluid Mechanics	3	
SSCK 1603	Organic Chemistry: Functional Group	3	
SSCK 1831	Organic Chemistry Practical	1	
SSCE 1793	Differential Equations	3	SSCE 1693
UHLB 2122	Academic Communication Skills	2	UHLB 1112
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**54**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETB 2133	Chemical Engineering Computation	3	
SETB 2213	Chemical Engineering Thermodynamics	3	SETB 2033
SETB 2313	Transport Processes*	3	SETB 2123#
SETB 2711	Thermodynamics and Material Eng. Laboratory	1	SETB 2033
SETB 1721	Bioprocess Engineering Laboratory: Upstream	1	
SSCK 1203	Analytical Chemistry for Engineering	3	
SSCK 1891	Analytical Chemistry Practical	1	
UKQF 2**2	Co-curriculum & service learning	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**71**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETB 3213	Biochemistry	3	
SETB 3223	Chemical Reaction Engineering	3	
SETB 3323	Separation Processes*	3	SETB 2313#
SETB 3413	Environmental Eng. and Sustainability	3	
SETB 2721	Fluid Mechanics Laboratory	1	
UHLB 3132	Professional Communication Skills	2	UHLB 2122
U*** 2**2	General Elective (Soft skill)	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**88**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETB 3113	Bioseparation Technology	3	
SETB 3143	Process Control*	3	SSCE 1793# SETB 3323
SETB 3173	Engineering Economics and Project Management	3	
SETB 3812	Undergraduate Project I**	2	
SETB 3721	Pollution Control and Reaction Laboratory	1	
SETB 3123	Molecular Biology & Genetic Engineering	3	
UHL* 1112	Foreign Language	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**105**	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SETB 3915	Industrial Training	5	
	TOTAL CREDIT	**5**	
	CUMULATIVE CREDITS	**110**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETB 4814	Undergraduate Project II**	4	SETB 3812#
SETB 3133	Bioreactor Design & Analysis	3	
SETB 4153	Plant Design*	3	SETB 3143
SETB 4163	Safety and Health in Chemical & BioIndustry	3	
SETB 3731	Separation Processes Laboratory	1	SETB 3323
SETB 3741	Bioprocess Engineering Laboratory: Downstream	1	

UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**126**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETB 4824	Plant Design Project**	4	SETB 4153, SETB 4163
SETB 4133	Quality Management in BioManufacturing	3	
SETB 4741	Process Control Laboratory	1	
UHIT 2302	The Thought of Science and Technology	2	
SETB 4**3	Bioprocess Elective Course 1	3	
SET* 5**3	PRISMS Elective Course 1		
SETB 4**3	Bioprocess Elective Course 2	3	
SET* 5**3	PRISMS Elective Course 2		
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**142**	

Note: * - cornerstone course; ** - capstone course; @ - with tutorial
- must pass (at least with grade D+) for pre-requisite course

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

*Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

BIOPROCESS ELECTIVE COURSES

SETB 4213 Food Process Engineering
SETB 4223 Environmental Biotechnology for Engineers
SETB 4233 Bioproduct Development and Processing
SETB 4243 Biopharmaceutical Engineering
SETB 4253 Green Energy Engineering
SETB 4263 Tissue Culture and Cell Engineering

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the courses are not allowed to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
CHEMICAL-BIOPROCESS ENGINEERING COURSES					
1	SETB 1011	Industrial Career & Seminar	1	1	
2	SETB 1021	Engineering Drawing	1	1	
3	SETB 1023	Introduction to Chemical & Bioprocess Engineering	3	3	
4	SETB 1123	Statics & Biomaterial	3	3	
5	SETB 2033	Thermodynamics	3	3	
6	SETB 1113	Mass Balance	3	3	
7	SETB 1133	Microbiology for Engineers	3	3	
8	SETB 2113	Introduction to Programming	3	3	
9	SETB 2123	Energy Balance	3	3	
10	SETB 2043	Fluid Mechanics	3	3	
11	SETB 2721	Fluid Mechanics Laboratory	1	1	
12	SETB 1721	Bioprocess Engineering Laboratory: Upstream	1	1	
13	SETB 2133	Chemical Engineering Computation	3	3	
14	SETB 2213	Chemical Engineering Thermodynamics	3	3	
15	SETB 2313	Transport Processes	3	3	
16	SETB 2711	Thermodynamics and Material Eng. Laboratory	1	1	
17	SETB 3213	Biochemistry	3	3	
18	SETB 3123	Molecular Biology & Genetic Engineering	3	3	
19	SETB 3223	Chemical Reaction Engineering	3	3	
20	SETB 3323	Separation Processes	3	3	
21	SETB 3413	Environmental Eng. and Sustainability	3	3	
22	SETB 3721	Pollution Control and Reaction Laboratory	1	1	
23	SETB 3113	Bioseparation Technology	3	3	

24	SETB 3133	Bioreactor Design & Analysis	3	3	
25	SETB 3812	Undergraduate Project I	2	2	
26	SETB 3731	Separation Processes Laboratory	1	1	
27	SETB 3143	Process Control	3	3	
28	SETB 3741	Bioprocess Engineering Laboratory: Downstream	1	1	
29	SETB 3173	Engineering Economics and Project Management	3	3	
30	SETB 3915	Industrial Training (YEAR 3/SHORT SEM.) for 12 weeks/3 months	5	HL	
31	SETB 4741	Process Control Laboratory	1	1	
32	SETB 4814	Undergraduate Project II	4	4	
33	SETB 4153	Plant Design	3	3	
34	SETB 4163	Safety and Health in Chemical & BioIndustry	3	3	
35	SETB 4824	Plant Design Project	4	4	
36	SETB 4133	Quality Management in BioManufacturing	3	3	
37	SETB ***3	Bioprocess Elective Course 1	3	3	
	SET* 5**3	PRISMS Elective Course 1			
38	SETB ***3	Bioprocess Elective Course 2	3	3	
	SET* 5**3	PRISMS Elective Course 2			
		TOTAL CREDIT OF CHEMICAL-BIOPROCESS ENGINEERING COURSES (a)	**99**	**94**	
APPLIED SCIENCE/ MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1993	Engineering Mathematics II	3	3	
3	SSCE 1793	Differential Equations	3	3	
4	SEEU 2003	Electrical Technology	3	3	
5	SSCK 1603	Organic Chemistry: Functional Group	3	3	

6	SSCK 1831	Organic Chemistry Practical	1	1	
7	SSCK 1203	Analytical Chemistry for Engineering	3	3	
8	SSCK 1891	Analytical Chemistry Practical	1	1	
		TOTAL CREDIT OF APPLIED SCIENCE/ MATHEMATICS COURSES (b)	**20**	**20**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHMS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			
2	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language Communication 2 (for International Students)			
Cluster 2: Generic Skills					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	U*** 2**2	General Elective (Soft skill)	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT 2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQF 2**2	Co-Curriculum & Service Learning	2	2	
2	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	

3	UHLB 3132	Professional Communication Skills	2	2	
4	UHL* 1112	Foreign Language	2	2	
Cluster 6: Entrepreneurial Skills					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**23**	**23**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**142**	**137**	

OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC).

- **Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.**
- **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**

COMPULSORY PSC COURSES (Enroll All 3 Courses)		
1	GLRB0010	Design Thinking for Entrepreneur
2	GLRM0010	Talent and Competency Management
3	GLRL0010	English Communication Skills for Graduating Students (ECS)
ELECTIVE PSC COURSE (Choose 2 Only)		
1	GLRT0010	Data Analytics for Organization
2	GLRM0020	Professional Ethics and Integrity
3	GLRT0020	Construction Measurement (Mechanical & Electrical)
4	GLRT0030	Oshe for Engineering Industry and Laboratory
5	GLRT0040	Oshe for Construction Industry and Laboratory Works
6	GLRT0050	Quality Management for Build Environment and Engineering Professionals
7	GLRT0060	Safety and Health Officer Introductory Course
		More elective courses to be added in future

COURSE SYNOPSIS

CORE COURSES

SETB 1011 - Industrial Career & Seminar

This course introduces students to the chemical/bioprocess engineering working environment through seminars from respective personnel and industrial visit to various chemical plants in Malaysia.

SETB 1021 - Engineering Drawing

Computer Aided Drawing Computer Aided Command, , Geometry, Orthographic Drawing, Isometric Drawing, Sectional Drawing, Flowchart Drawing.

SETB 1023 - Introduction to Chemical & Bioprocess Engineering

Overview of engineering, the profession and its requirements in the Malaysian scenario. Communication (oral and written) and teamwork skills. Mind mapping, learning styles and time management. Basic calculations and unit conversions. Create an engineering graph and solving iterative problems using computer. Ethics. Seminar. Plant visits. This course employs Cooperative Learning and grooms students with skills for Problem-based Learning.

SETB 1123 - Statics & Biomaterial

This course is designed to introduce students to the basic principles and concepts in mechanics. The content will be divided into two parts which are i) statics and ii) strength of material/biomaterial. The first part will deal with the resultant and resolution of force(s) acting on a particle, the equilibrium of a particle, the effect of force(s) on a rigid body, how to replace a force system with an equivalent system and the equilibrium of rigid bodies. At the end of the course, students should be able to demonstrate and apply the knowledge by solving various problems in Statics. The second part will focus on the types of material/biomaterial (introduction, overview) and will follow with few elements that are important in understanding the material/biomaterial (atomic bonding, structures, strength analysis etc.). At the end of this part, should be able to relate material/biomaterial and its characteristics in order to choose the right material for different applications especially in medical devices etc.

SETB 1133 - Microbiology

The course aims to provide a strong background of various types of microorganisms to the engineering students. Topics include microbe diversity; metabolism type-based classification; factors that determine the growth and their control techniques; microbial ecology; fundamentals of immunology; and biotechnological aspects of microbes.

SETB 1113 - Mass Balance

Introduction to chemical engineering and chemical processes, process and process variables, material balance strategy, degree of freedom analysis, material balance with reactions, material balance with recycle, single-phase and multiphase systems. Introduction to energy balance.

SETB 1721 - Bioprocess Engineering Laboratory: Upstream
This laboratory course is designed to expose students to basic microbiology, biochemistry and genetic engineering techniques. The experiment will expose students to handling bacterial culture, analysis of biomolecules such as enzymes and carbohydrates.

SETB 2113 - Introduction to Programming
This course primarily aimed at the beginner who has no or little experience of using compiled languages. It is an introductory course to two different types of programming languages. First, is the C programming language and secondly, is the Matlab programming language. The course will cover various stages of programme development for both types of programming language. One who completed the course will have the ability to write a simple program using both C programming language and Matlab programming language.

SETB 2123 - Energy Balance
Pre Requisite: SETB 1113 Mass Balance (passed)
Energy balance on non-reactive systems, balance on reactive systems, material and energy balances on transient processes, entropy, power and refrigeration cycles.

SETB 2043 - Fluid Mechanics
Physics of fluid: what is fluid, some definitions, surface tension, compressible and incompressible flow, classes of flow, and physical classification. Fluid statics: pressure, differential equations of fluid statics, manometry, fluid force on submerged bodies, buoyancy and stability of floating bodies, and liquid in relative equilibrium. Fluid in motion: continuity equation, energy and mass equilibrium, Euler, Bernoulli and Momentum equations. Friction in fluid flow: velocity profile in pipes, roughness, friction factor, Moody chart. Flow measurement: venturi and pitot tube, orifice, notches and weirs. Pump and pumping: principle, types, selection, and application of pumps. Dimensional analysis, similitude in fluid mechanics, parameters of incompressible and compressible flow.

SETB 2721 - Fluid Mechanics Laboratory
The course covers seven fluid mechanics-related experiments which are friction losses in pipe, stability of floating body, jet impact, flow measurement, centrifugal pump, forced vortex flow, and calibration of bourdon tube pressure gauge.

SETB 2033 - Thermodynamics
Thermodynamics is an important basic engineering subject where concepts such as systems, boundaries, mass, heat, work and energy are introduced. These concepts are then related using the 1st and 2nd Law of Thermodynamics. In this subject properties of common substances such as water, air and general working fluids are introduced using property tables and basic state equations. These concepts are applied in many engineering equipments, basic refrigeration and power cycles. Such basic concepts are vital because they form the fundamentals for future chemical engineering subjects.

SETB 2133 - Chemical Engineering Computation

This course introduces students to some numerical techniques in solving chemical engineering problems that could not be solved analytically. Students will be exposed to the numerical solution for root of equation, simultaneous algebraic equation, curve fitting, ordinary differential equations, numerical differentiation and integration problems. MATLAB programming language will be implemented with the intention of illustrating the nuance of the methods, and showing more realistically how the methods are applied for problem solving.

SETB 2213 - Chemical Engineering Thermodynamics

Pre Requisite: SETB 2033 Thermodynamics (taken)

Volumetric properties of pure liquid, heat effects, thermodynamics properties of fluids, properties relationship for homogeneous mixture, phase equilibrium and chemical reaction equilibrium.

SETB 2313 - Transport Processes

Pre Requisite: SETB 2123 Energy Balance (passed)

Fundamentals of mass transfer, rate equation for molecular diffusion, mass transfer at boundary layer, mass transfer between phases, mass transfer rate at simple surface geometry, simultaneous mass transfer and chemical reaction. Also included is heat transfer theory, conduction, steady state conduction in two dimensions, steady state conduction with convection to environment, unsteady-state conduction, convection, radiation heat transfer, heat exchanger design.

SETB 2711 - Thermodynamics and Materials Engineering Laboratory

Pre Requisite: SETB 2033 Thermodynamics (taken)

Experiments performed in this laboratory include boiler tests, diesel engine performance test, equilibrium test, energy (heat engine), tensile test, metal metalography, determination of Young modulus, air compressor, cooling system, torsion testing, stress and strain analysis.

SETB 3213 - Biochemistry

This course is designed to give an overall outlook on basic chemistry of major biomolecules and their roles in biological systems. Topics include introducing the structure, properties, and functionalities of major biomolecules such as carbohydrates, proteins, lipids; roles of lipids in membrane; Michaelis-menten enzyme kinetics, major catabolism pathways such as glycolysis, and TCA cycle; electron transport system and oxidative phosphorylation; structure and functions of DNA and RNA.

SETB 3123 - Molecular Biology & Genetic Engineering

The course introduces students to fundamental aspects of molecular biology and gene manipulation. Discussion will emphasize on synthesis, organization, replication of DNA and RNA both eukaryote and prokaryote systems; roles of RNA in translation and transcription; regulation in gene transcription; protein synthesis and post-translational modification; recombinant technology (e.g. gene transfer and splicing techniques, genomic library development).

SETB 3223 - Chemical Reaction Engineering
Topics in this course are: introduction to homogeneous reaction kinetic, batch reactor data analysis, introduction to reactor design, single reactor design, reactor design for single reaction and multiple reactor, temperature and pressure effect, nonideal flow, introduction to heterogeneous reaction system design, types of reactor test, catalytic reaction.

SETB 3323 - Separation Processes
Pre Requisite: SETB 2313 Transport Processes (passed)
Introduction to unit operations in chemical engineering: evaporation, liquid-liquid separation, liquid vapour separation, liquid-liquid extraction and leaching.

SETB 3413 - Environmental Eng. and Sustainability
Introduction to pollution control includes: water pollution, air pollution, noise pollution and environmental acts and techniques to reduce pollutants.

SETB 3721 - Pollution Control and Reaction Laboratory
Experiments performed in this laboratory are: acidity and alkalinity, biological oxygen demand (BOD), coagulation and flocculation, ambient air quality monitoring, the use of direct spectrophotometer, conductivity measurement, sludge index, water sampling. To test the saponification reaction, iodine reaction, esterification reaction, continuous stirred tank reactor and biodiesel production

SETB 3113 - Bioseparation Technology
The aim of the course is to provide an overview of the various downstream processes involved in the production of bioproducts such as food, beverages, antibiotics, antiferons, vitamins, insulins, citric acid and others. The unique natures of biomolecules make their separation processes different from conventional chemical processes. In addition, the application of mass transfer, mass balances, and thermodynamics principles are combined with life sciences so as to develop, impart and vary the biotechnology purification techniques. The various bioseparation techniques include centrifugation, microfiltration, ultrafiltration, adsorption, chromatography, electrophoresis, and many more.

SETB 3133 - Bioreactor Design & Analysis
The aim of the course is to analyze the bioreactor functions so that the intended fermentation performance can be achieved. It will emphasize on mass balances on growth and product formation, kinetics of three main operation modes, oxygen transfer in aerobic cultures, heat sources and their management, power consumption, rheological effect on mixing, scaling up, the architecture and functional parts of bioreactor, and instrumentation and control.

SETB 3812 - Undergraduate Project I
A first stage of the Undergraduate Project which involves preliminary studies and planning on how to carry out the study given to the student. The works include literature review, problem and scope identification, objective and method determination.

SETB 3731 - Separation Processes Laboratory

Pre Requisite: SETB 3323 Separation Processes (taken)

Evaporation operation, distillation operation, gas-liquid absorption operation, drying operation, liquid physical and chemical properties identification and heat transfer.

SETB 3741 - Bioprocess Engineering Laboratory: Downstream

In this laboratory, students are given the opportunity to gain experience in bioreactor and downstream processes (bioseparation). This laboratory work will assist the students to consolidate their fundamental understanding involved in fermentation and downstream processes of bioproducts. The experiments performed are fermentation in shake flask and 2 L bioreactor, cell immobilization, microfiltration, cell homogenization, protein precipitation and a final project.

SETB 3143 - Process Control

Pre Requisite: SSCE 1793 (passed), SETB 3323 Separation Processes (taken)

This subject covers chemical process control, static and dynamic process behaviour, mathematical modelling, analysis of dynamic chemical process behaviour, analysis and design of feedback control systems, analysis and design of complex control systems.

SETB 3173 Engineering Economics and Project Management

The engineering economy study involves computing a specific economic measure of worth for estimated cash flows over a specific period of time. Project Management is the art of planning, scheduling, and controlling of project activities to achieve performance, cost, and time objectives, for a given scope of works, while using resources efficiently and effectively.

SETB 3915 - Industrial Training

A 12-week training in industry. The main rationale of introducing the programme is to provide UTM students with exposure to practical aspects of industry and their work practices. During the programme, the students will have the opportunity to relate their theoretical understanding to the real application in industry and to develop skills in work ethics, management, communication and human relations.

SETB 4741 - Process Control Laboratory

Experiments performed in this laboratory include: PLC, introduction to transducers and instrumentation, control of a heat exchanger, liquid level control, analysis of dynamic response, and controller tuning.

SETB 4814 - Undergraduate Project II

Pre Requisite: SETB 3212 Undergraduate Project I (passed)

Students are required to do research projects where they are required to collect data from the apparatus in the laboratory and pilot plant under the supervision of a lecturer. The use of computers is also emphasised. Students are required to submit a report at the seminar at the end of the project.

SETB 4153 - Plant Design

Pre Requisite: SETB 3143 Process Control (taken)

Introduction to process plant synthesis where design of each individual unit operation is combined with the objective of optimising the raw material and energy use for processing, cost factor and economics, environmental and also safety factor. Selection of reactor design, selection of separator design, reaction-separation system synthesis and also heat exchanger network synthesis, process safety, and waste minimisation.

SETB 4163 - Safety and Health in Chemical & BioIndustry

Main danger and act, introduction to relief, occupational safety and health, danger identification, risk analysis, accident inspection.

SETB 4824 - Plant Design Project

Pre Requisite: SETB 4153 Plant Design, SETB 4163 Safety and Health in Chemical & BioIndustry (taken)

Students are divided into groups. Each group will be given a design topic and will be under the supervision of a lecturer. The design project involves process selection, building the process flow diagram (PFD), material and energy balances, detailed equipment design, equipment selection and material of construction, equipment control, operational instruction, economics and costing.

SETB 4133 - Quality Management in BioManufacturing

This course highlights the importance of a quality management system in bioproduct manufacturing processes/industries to meet customer satisfaction. The quality system will cover both management and technical elements according to the requirements of the International Organization for Standardization (ISO) and other relevant regulations. The management requirements focus on a clear organization structure with well-defined objectives and well-organized documentation, whereas the technical requirements ensure on the competency of staffs and validity of test methods for quality assurance. The techniques and validation procedures will be included for numerous types of bioproducts such as cosmeceuticals, nutraceuticals, functional foods and pharmaceuticals. Up-to-date technologies combined with systematic validation plan will ensure bioproduct quality and its consistency.

BIOPROCESS ELECTIVE COURSES

SETB 4213 - Food Process Engineering

This course introduces students to some major principles, concepts and applications in handling, processing and packaging of foods including the design of process equipment. The course will also provide practice in case studies, carrying out an industrial visit project to observe the application of knowledge in food industries and setting informative research on the business planning of selective food processing operations.

SETB 4223 - Environmental Biotechnology for Engineers

This course describes the diverse problems of the environment and the approaches toward their solution or mitigation in connection to the modern or classical methods of biotechnology. It describes the significance in conservation of environmental resources and biodiversity, provision for alternate sources of energy, biological control of pests and pathogens, purification of environment, mitigation of problems of chemical fertilizers, and most important of all, improvement in the quality of life.

SETB 4233 - Bioproduct Development and Processing

This course introduces bioproduct and their processing technologies. Students are explored to various kinds of high potential bioproducts with their relevant processing technologies for formulation and development. Factors that affecting quality, safety and efficacy are highlighted in order to make them aware of the importance of these factors for bioproduct sustainability. Quality management systems in bioproduct manufacturing processes/industries are discussed and elaborated to lead students meeting customer satisfaction. The quality system will cover both management and technical elements according to the requirements of the International Organization for Standardization (ISO) and other relevant regulations. The technical requirements ensure the competency of staff and validity of test methods for quality assurance. The course will equip students with quality management skill and knowledge, especially in bioproduct selection and manufacturing.

SETB 4243 - Biopharmaceutical Manufacturing

This course describes the application of biotechnology procedures in the field of Pharmacy. It emphasizes on consolidating the fundamental understanding in biotechnology and phytochemical processing involved in the development and production of pharmaceutical products. The technologies covered in the course are methods to enhance the production, bioavailability and safety of biopharmaceutical products or services. Elements of businesses driven through biopharmaceutical discoveries and understanding of specific quality issues in compliance with regulatory requirements throughout the clinical development and post-approval processes are exposed to students.

SETB 4253 - Green Energy Engineering

The course introduces the fundamental principles and concepts in understanding bioenergy/biofuels systems. Fundamental concepts in understanding biofuels/bioenergy systems; renewable feedstocks, their production, availability and attributes for biofuel/bioenergy production; types of biomass derived fuels and energy; thermochemical conversion of biomass to heat, power and fuel; biochemical conversion of biomass to fuel; type of biofuels, environmental aspects of biofuel production; economics and life-cycle analysis of biofuel; value adding of biofuel residues; case studies on biofuel production, sustainable processes for biofuels.

BACHELOR OF CHEMICAL ENGINEERING (GAS) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Chemical Engineering (Gas) with Honours is offered on a full-time basis. The programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on a full-time basis and is based on two semesters per academic session. Generally, students are expected to undertake courses equivalent to between twelve (12) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Chemical Engineering (Gas) with Honours	
4. Final Award			Bachelor of Chemical Engineering (Gas) with Honours	
5. Programme Code			SETGH	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study			Conventional	
9. Mode of operation			Self-govern	
10. Study Scheme			Full Time	
11. Study Duration			Minimum : 4 years Maximum : 6 years	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	14	-
Short	4	-	8	-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (a) General (b) Language (c) Entrepreneurship (d) Co-Curriculum	 10 8 2 3	16.7%
ii.	Faculty/ Programme Core	106	76.8%
iii.	Programme Elective	9	6.5%
	Total	**138**	**100%**
A	Engineering Courses (a) Lectures (b) Laboratory/ Workshop (c) Industrial Training (d) Final Year Project (e) Integrated Design Project	 75 7 5 6 4	70.3%
Total Credit Hours for Part A		**97**	
B	Related Courses (a) Applied Science/Mathematics/ Computer (b) Management/ Law/ Humanities / Ethics (c) Language (d) Co-Curriculum	 18 12 8 3	29.7%
Total Credit Hours for Part B		**41**	
Total Credit Hours for Part A and B		**138**	**100%**
Total Credit Hours to Graduate		**138 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 138 credit hours with a minimum CGPA of 2.00.
- Pass Industrial Training.
- Complete all Professional Skill Courses.

CROSS-CAMPUS PROGRAMME

Students are given the opportunity to enroll in a few courses in participating universities. The grades and credits obtained during this period are transferable (up to 1/3 of the total credits of the curriculum). Currently, there are four participating universities i.e. Universiti Teknologi Malaysia, Universiti Sains Malaysia, Universiti Malaya and Universiti Malaysia Sarawak.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

(i) The total number of credits allowed to be taken is between twelve (12) and sixteen (16) credits only.
(ii) The student should hold a minimum CGPA of 3.00 at the time of application.
(iii) The student is not a resident of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However, should the participating university provide accommodation, the student will need to pay accommodation fees.

COURSE MENU

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEU 2003	Electrical Technology	3	
SETG 1233	Introduction to Chemical and Gas Engineering	3	
SETG 1313	Mechanics of Engineering	3	
SETG 1323	Engineering Drawing	3	
SSCE 1693	Engineering Mathematics I@	3	
UHLB 1112	English Communication Skills	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**17**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECP 1013	Programming Technique I	3	
SETG 1333	Thermodynamics@	3	
SETG 1413	Mass Balance*@	3	
SETG 2343	Fluid Mechanics	3	
SSCE 1993	Engineering Mathematics II@	3	SSCE 1693
UHIS 1022	Philosophy and Current Issues (for Local Students)	2	
UHLM 1012	Malay Language Communication 2 (for International Students)		
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**34**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETG 2353	Introduction to Organic and Analytical Chemistry for Engineers	3	
SETG 2423	Energy Balance@	3	SETG 1413#
SETG 2741	Fluid Mechanics Laboratory	1	SETG 2343
SSCE 1793	Differential Equations	3	
UBSS 1032	Introduction to Entrepreneurship	2	
UHLB 2122	Academic Communication Skills	2	UHLB 1112
UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students Only)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation Ethics and Civilizations (for International Students)		
UHMT 1012	Graduate Success Attributes	2	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**52**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETG 2133	Combustion Engineering and Gas Utilisation	3	
SETG 2363	Material Engineering	3	SETG 1313
SETG 2433	Chemical Engineering Thermodynamics	3	SETG 1333# SETG 2423
SETG 2443	Transport Processes*	3	SETG 2423
UHIT 2302	The Thought of Science and Technology	2	
UETS 2142	Energy Sustainability (University General Elective)	2	
UKQF 2**2	Co-Curriculum	2	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**70**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETG 3213	Gas Transmission and Distribution*	3	SETG 2343
SETG 3373	Environmental Engineering and Sustainability	3	
SETG 3453	Chemical Engineering Computation	3	SSCE 1693 SSCE 1993
SETG 3463	Chemical Reaction Engineering	3	SETG 2423
SETG 3473	Separation Process*	3	SETG 2443#

SETG 3751	Thermodynamics and Material Engineering Laboratory	1	SETG 2363 SETG 1333
SETG 3721	Combustion Engineering and Gas Utilisation Laboratory	1	SETG 2133
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**88**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETG 3123	Gas Processing and Liquefaction	3	
SETG 3383	Safety and Health in Petrochemical Industry	3	
SETG 3483	Process Control and Instrumentation	3	SSCE 1793 SETG 3473
SETG 4711	Gas Flow System Laboratory	1	SETG 3213
SETG 4761	Pollution Control and Reaction Laboratory	1	SETG 3463 SETG 3373
SETG 3812	Undergraduate Project I**	2	
UHLB 3132	Professional Communication Skills	2	UHLB 2122
UHL* 1112	Foreign Language Elective	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**105**	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SETG 3915	Industrial Training	5	
	TOTAL CREDIT	**5**	
	CUMULATIVE CREDITS	**110**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETG 3731	Separation Process Laboratory	1	SETG 3473
SETG 4393	Engineering Economics and Project Management	3	
SETG 4493	Plant Design*	3	SETG 3473
SETG 4771	Process Control Laboratory	1	SETG 3483
SETG 4824	Undergraduate Project II**	4	SETG 3812#
SETG 4**3	Elective I	3	
SET* 5**3	PRISMS Elective I		
	TOTAL CREDIT	**15**	
	CUMULATIVE CREDITS	**125**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETG 3731	Separation Process Laboratory	1	SETG 3473
SETG 4393	Engineering Economics and Project Management	3	
SETG 4493	Plant Design*	3	SETG 3473
SETG 4771	Process Control Laboratory	1	SETG 3483
SETG 4824	Undergraduate Project II**	4	SETG 3812#
SETG 4**3	Elective I	3	
SET* 5**3	PRISMS Elective I		
	TOTAL CREDIT	**15**	
	CUMULATIVE CREDITS	**125**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETG 4610	Gas Engineering Seminar	0 (HL)	
SETG 4223	Gas Storage and Reticulation System*	3	SETG 3213
SETG 4834	Plant Design Project**	4	SETG 3383 SETG 4493
SETG 4**3	Elective II	3	
SET* 5**3	PRISMS Elective II		
SETG 4**3	Elective III	3	
SET* 5**3	PRISMS Elective III		
	TOTAL CREDIT	**13**	
	CUMULATIVE CREDITS	**138**	

Note: * - cornerstone course; ** - capstone course; @ - with tutorial
- must pass (at least with grade D+) for prerequisite course

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

*Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

Elective Courses

1. Energy
   - SETG 4113 Carbon Capture and Sequestration
   - SETG 4143 Energy Management and Economics
   - SETG 4153 Energy Conversion Technology
   - SETG 4163 Green Energy Technology
   - SETG 4243 Non-Conventional Oil and Gas Exploitation

2. Gas

- SETG 4173 Membrane Based Gas Separation Technology
- SETG 4253 Gas Production Engineering
- SETG 4263 Fire and Explosion Safety
- SETG 4273 Gas Operation and Maintenance
- SETG 4283 Corrosion Engineering

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the courses are not allowed to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
CHEMICAL-GAS ENGINEERING COURSES					
1	SETG 1233	Introduction to Chemical and Gas Engineering	3	3	
2	SETG 1313	Mechanics of Engineering	3	3	
3	SETG 1323	Engineering Drawing	3	3	
4	SETG 1333	Thermodynamics	3	3	
5	SETG 1413	Mass Balance	3	3	
6	SETG 2133	Combustion Engineering and Gas Utilisation	3	3	
7	SETG 2343	Fluid Mechanics	3	3	
8	SETG 2363	Material Engineering	3	3	
9	SETG 2423	Energy Balance	3	3	
10	SETG 2433	Chemical Engineering Thermodynamics	3	3	
11	SETG 2443	Transport Processes	3	3	
12	SETG 2741	Fluid Mechanics Laboratory	1	1	
13	SETG 3123	Gas Processing and Liquefaction	3	3	
14	SETG 3213	Gas Transmission and Distribution	3	3	
15	SETG 3373	Environmental Engineering and Sustainability	3	3	
16	SETG 3383	Safety and Health in Petrochemical Industry	3	3	
17	SETG 3453	Chemical Engineering Computation	3	3	
18	SETG 3463	Chemical Reaction Engineering	3	3	
19	SETG 3473	Separation Process	3	3	
20	SETG 3483	Process Control and Instrumentation	3	3	
21	SETG 3721	Combustion Engineering and Gas Utilisation Laboratory	1	1	

22	SETG 3731	Separation Process Laboratory	1	1	
23	SETG 3751	Thermodynamics and Material Engineering Laboratory	1	1	
24	SETG 3812	Undergraduate Project I	2	2	
25	SETG 3915	Industrial Training	5	HL	
26	SETG 4223	Gas Storage and Reticulation System	3	3	
27	SETG 4393	Engineering Economics and Project Management	3	3	
28	SETG 4493	Plant Design	3	3	
29	SETG 4610	Gas Engineering Seminar	0 (HL)	0 (HL)	
30	SETG 4711	Gas Flow System Laboratory	1	1	
31	SETG 4761	Pollution Control and Reaction Laboratory	1	1	
32	SETG 4771	Process Control Laboratory	1	1	
33	SETG 4824	Undergraduate Project II	4	4	
34	SETG 4834	Plant Design Project	4	4	
35	SETG 4**3	Elective I	3	3	
	SET* 5**3	PRISMS Elective I			
36	SET* ***3	Elective II	3	3	
	SET* 5**3	PRISMS Elective II			
37	SET* ***3	Elective III	3	3	
	SET* 5**3	PRISMS Elective III			
		TOTAL CREDIT OF CHEMICAL-GAS ENGINEERING COURSES (a)	**97**	**92**	
MATHEMATICS/ SCIENCE/ TECHNOLOGY COURSES (Faculty of Science/ Faculty of Engineering)					
1	SECP 1013	Programming Technique I	3	3	
2	SEEU 2003	Electrical Technology	3	3	
3	SETG 2353	Introduction to Organic and Analytical Chemistry for Engineers	3	3	
4	SSCE 1693	Engineering Mathematics I	3	3	
5	SSCE 1793	Differential Equations	3	3	
6	SSCE 1993	Engineering Mathematics II	3	3	
		TOTAL CREDIT OF MATHEMATICS/ SCIENCE/ TECHNOLOGY COURSES (b)	**18**	**18**	

UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHMS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			
2	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language Communication 2 (for International Students)			
Cluster 2: Generic Skills					
1	UHMT 1012	Graduate Success Attribute	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT 2302	The Thought of Science and Technology	2	2	
2	UETS 2142	Energy Sustainability (University General Elective)	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQF 2**2	Co-Curriculum	2	2	
2	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHL* 1112	Foreign Language Elective	2	2	

Cluster 6: Entrepreneurial Skills					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**23**	**23**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**138**	**133**	

OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC).

- **Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.**
- **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**

COMPULSORY PSC COURSES (Enroll All 3 Courses)		
1	GLRB0010	Design Thinking for Entrepreneur
2	GLRM0010	Talent and Competency Management
3	GLRL0010	English Communication Skills for Graduating Students (ECS)
ELECTIVE PSC COURSE (Choose 2 Only)		
1	GLRT0010	Data Analytics for Organization
2	GLRM0020	Professional Ethics and Integrity
3	GLRT0020	Construction Measurement (Mechanical & Electrical)
4	GLRT0030	Oshe for Engineering Industry and Laboratory
5	GLRT0040	Oshe for Construction Industry and Laboratory Works
6	GLRT0050	Quality Management for Build Environment and Engineering Professionals
7	GLRT0060	Safety and Health Officer Introductory Course
		More elective courses to be added in future

COURSE SYNOPSIS

CORE COURSES

SETG 1233 - Introduction to Chemical and Gas Engineering

The objective of this course is to introduce chemical and gas engineering and prepare students for learning engineering to become an engineer of the future. This course serves to bridge pre-university education to university life and provide support for adjusting to learning and expectations in tertiary education. The topics/skills that will be learnt in this course include: overview of engineering & chemical gas engineering, basic principles of gas engineering related processes, uses of Microsoft Excel, basic calculations of common process variables and cooperative Problem-Based Learning (CPBL) case study on sustainable development. One of the important elements of the CPBL case study is Teaching-Research Nexus (TRN) in which students will learn through research even at the undergraduate level.

SETG 1313 - Mechanics of Engineering

This course is designed to introduce students to the basic principles and concepts in mechanics. It deals with statics in engineering mechanics that are the resultant and resolution of force(s) acting on a particle, the equilibrium of a particle, the effect of force(s) on a rigid body, how to replace a force system with equivalent system, the equilibrium of rigid bodies, determination of centroid as well as analysis of structure and friction. This course also includes the dynamics in engineering mechanics that are determination of rectilinear and curvilinear motions of particle and analysis of principle of work and energy. At the end of the course, students should be able to demonstrate and apply the knowledge by solving various problems in Statics and Dynamics, which forms the basis of further engineering subjects especially Mechanics of Materials and Fluid Mechanics.

SETG 1323 - Engineering Drawing

This course provides a fundamental background in engineering drawing to the students, which will enable them to work more effectively in the various fields of engineering. This course aims at developing the skills needed for documenting designs using drawings and for performing graphical analysis of two dimensional and three dimensional problems. The students will be exposed to available CAD for engineering drawing with more emphasis on the utilization of AutoCAD software. This course focuses on the introduction to engineering drawing, fundamentals of engineering drawing, geometry, orthographic and isometric drawing. This course also introduces the sectional drawing and computer aided engineering drawing to the students. Besides that, this course also provides the basic skills and concept on the technical drawing of the gas engineering related Piping & Instrumentation Diagram (P&ID) that is essential for process industries.

SETG 1333 - Thermodynamics

Thermodynamics is an important basic engineering subject where concepts such as systems, boundaries, mass, heat, work and energy are introduced. These concepts are then related using the 1st and 2nd Law of Thermodynamics. In this subject properties of common substances such as water, air and general working fluids are introduced using property tables and basic state equations. These concepts are applied in many engineering equipments, basic

refrigeration and power cycles. Such basic concepts are vital because they form the fundamentals for future chemical-gas engineering courses.

SETG 1413 - Mass Balance
This course introduces students to the chemical engineering profession and the fundamental operations of chemical process equipment. It also provides students with the basic principles of chemical engineering material balances as well as calculation techniques to solve material balance problems for chemical process systems and equipment.

SETG 2343 - Fluid Mechanics
Physics of fluid: what is fluid, some definitions, surface tension, compressible and Incompressible flow, classes of flow, and physical classification. Fluid statics: pressure, differential equations of fluid statics, manometry, fluid force on submerge bodies, buoyancy and stability of floating bodies, and liquid in relative equilibrium. Fluid in motion: continuity equation, energy and mass equilibrium, Euler, Bernoulli and Momentum equations. Friction in fluid flow: velocity profile in pipes, roughness, friction factor, Moody chart. Flow measurement: venturi and pitot tube, orifice, notches and weirs. Pump and pumping: principle, types, selection, and application of pumps. Dimensional analysis, similitude in fluid mechanics, parameters of incompressible and compressible flow.

SETG 2423 - Energy Balance
Pre-requisites: SETG 1413 (pass with at least D+)
This course introduces students to the chemical engineering profession and the fundamental operations of chemical process equipment. It also provides students with the basic principles of chemical engineering energy balances as well as calculation techniques to solve the material and energy balance problems for chemical process systems and equipment.

SETG 2133 - Combustion Engineering and Gas Utilisation
This course enables students to understand the basic concept of combustion and related calculations as well as to expose them to the concept of flame, explosion, and detonation and its related safety aspects. In addition, it permits students to explain the use of gaseous fuels and its related energy generating technologies and equipment. The important concept and methods of fuel inter-changeability will be highlighted. The course also covers some fundamental aspects of gas utilization and equipment for various applications.

SETG 2363 - Material Engineering
Pre-requisites: SETG 1313 (taken)
The first part of SETG 2363 is introductory Materials Engineering. Topics include classification of materials (metals, ceramics, polymers, composites and semiconductors); atomic bonds; crystal structure; crystalline defects and solid solutions; and phase diagrams. Main emphasis is on metals because metals are structurally the simplest to characterize and a sound knowledge of structure-property relation of metals can be extended to the study of ceramics and polymers. The second part of the course deals with Mechanics of Materials. Topics cover stress and deformation of members under axial loading, torsion in circular shafts, analysis and design of beams for bending, and stress transformation. Throughout the course, strong

emphasis is placed on drawing a free-body diagram, selecting appropriate coordinate system, using the correct sign convention.

SETG 2433 - Chemical Engineering Thermodynamics
Pre-requisites: SETG 1333 (pass with at least D+), SETG 2423 (taken)
This course introduces students to the chemical engineering thermodynamic theory and applications in the areas of volumetric properties of fluids, heat effects, thermodynamic properties of fluids, thermodynamics of solutions, and physical and chemical equilibria.

SETG 2443 - Transport Processes
Pre-requisites: SETG 2423 (taken)
This course introduces principles and applications of unit operation involving separation processes in gas-liquid, liquid-liquid and solid-liquid systems. It also deals with design of separation operations using heat and mass transfer principles.

SETG 2741 - Fluid Mechanics Laboratory
Pre-requisites: SETG 2343 (taken)
This laboratory course contains 7 experiments that cover basic concepts in Fluid Mechanics. Laboratory experiments are designed for hands-on experience to understand the engineering principles. The experiment includes Flow Measurement, Bernoulli's Principles, Stability of Floating Body, Jet Impact, Forced Vortex Flow, Minor and Major Losses in Pipes. This course also emphasizes the technical writing aspect where all students' observation and arguments of each experiment must be reported in proper format.

SETG 3123 - Gas Processing and Liquefaction
This course is designed to expose students to techniques and technologies of processing and liquefying hydrocarbon and non-hydrocarbon gases. The course enables students to relate and apply the knowledge of some core chemical engineering courses such as mass and energy balance, separation process in gas production and liquefaction processes. A visit or exposure to the related industries which requires students to prepare a brief report will also be arranged for them gain some industrial insides.

SETG 3373 - Environmental Engineering and Sustainability
This course introduces the cause, effect and method to control pollution from industries. The course covers the three major categories of industrial pollution; water pollution, air pollution and industrial waste management. In the first part, the course includes the source and types of water pollutants, environmental regulations pertaining to waste water discharge, and techniques to treat wastewater before discharging to the environment. The second part of the course covers the source and effect of air pollution, regulations requirements for air pollution control, and technology to control air pollution emissions from industries. The third part covers the management of industrial waste that includes definition of scheduled waste, scheduled waste regulations, and techniques to manage the waste.

SETG 3453 - Chemical Engineering Computation

Pre-requisites: SSCE 1693, SSCE 1993 (taken)

This course introduces students to some numerical techniques in solving problems that could not be solved analytically. Students will be exposed to the numerical solution for the root of equation, system of linear algebraic equations, curve fitting, ordinary differential equations, differentiation and integration problems. MATLAB programming language will be implemented with the intention of illustrating the nuance of the methods, and showing more realistically how the methods are applied for problem solving.

SETG 3463 - Chemical Reaction Engineering

Pre-requisites: SETG 2423 (taken)

This course introduces students to chemical reactor design and theories in the area of chemical reaction engineering with emphasis on homogeneous and heterogeneous reactions. It will examine some problems related to multiple reactions and non-isothermal operations. Students will also work cooperatively on a computer assignment to expose them to solving problems using software packages such as PolyMath.

SETG 3473 - Separation Process

Pre-requisites: SETG 2443 (pass with at least D+)

This course introduces principles and applications of unit operation involving separation processes in gas-liquid, liquid-liquid and solid-liquid systems. It also deals with design of separation operations using heat and mass transfer principles.

SETG 3751 - Thermodynamics and Material Engineering Laboratory

Pre-requisites: SETG 2363, SETG 1333 (taken)

This laboratory course contains 6 experiments that covered basic concepts in Thermodynamics and Strength of Material. Laboratory experiments are designed for hand-on experience to understand the engineering principles. The experiments application includes First Law of Thermodynamics, Second Law of Thermodynamics, Properties of Pure Substance and Properties & Strength of Materials. This course also emphasizes the technical writing aspect where all students' observation and arguments of each experiment must be reported in proper format.

SETG 3213 - Gas Transmission and Distribution

Pre-requisites: SETG 2343 (taken)

This course is design to expose student to hydrocarbon gas transmission and distribution system. The course contents include an introduction to gas industry, gas delivery concept, codes and standards in gas pipeline system, gas hydraulics, gas pipeline network analysis, construction, materials and procedures, operation and maintenance and gas regulation and measurements. A visit to the related industries which requires student to prepare a brief report and application of CEASER II software will be arranged for them to gain some industrial experience.

SETG 3383 - Safety and Health in Petrochemical Industry

This course presents fundamental principle of safety and risk assessment in chemical process industry. In particular, it emphasises on safety legislations, inherent safety design concept, and applies various method of process hazard identification on petrochemical process and health risk assessment. At the end of this course, it is expected that the students will be able to appreciate the theoretical and practical aspect of occupational safety, health and environment in petrochemical process industry and also be able to use the techniques of hazard identification and risk assessment in the design and operation of petrochemical plant.

SETG 3483 - Process Control and Instrumentation

Pre-requisites: SSCE 1793, SETG 3473 (taken)

This course covers the fundamentals of dynamic process modelling, dynamic process behaviours and process control. Although more concentration is given to lumped parameter systems modelling, distributed parameter systems is introduced. Feedback control system design, analysis and tuning are dealt with in detail. Also included are model estimation techniques for first order plus deadtime (FOPDT) systems. Other commonly found control structures, such as feedforward, ratio, split-range and cascade control, and plant-wide control systems design are taught qualitatively. This course employs Active Learning (AL).

SETG 3721 - Combustion Engineering and Gas Utilisation Laboratory

Pre-requisites: SETG 2133 (taken)

The laboratory is the practical introduction to the method of determining fuel characteristics such as specific gravity and calorific value. This course also introduces students to the method of determining flame properties such as flame speed and flame characteristics. It also enables students to obtain understanding of a few phenomenon during combustion with some related factors. Students also are introduced into explosion study. At the end of this course, students will able to describe and explain the process and operation of equipment related to gas combustion engineering such as boiler, gas absorption refrigeration system, and gas turbine system.

SETG 4761 - Pollution Control and Reaction Laboratory

Pre-requisites: SETG 3463, SETG 3373 (taken)

This laboratory course contains experiments that are covered basis concept in chemical reaction engineering and pollution control such as kinetic analysis of reaction, ambient air and water quality analysis. All experiments require students to apply fundamental laboratory techniques and skills as well as communication skill. Students, in group will demonstrate a mastery of laboratory techniques and clearly describe the qualitative and quantitative aspects of the experiments performed.

SETG 3812 - Undergraduate Project 1

This course is designed to train students on some important aspects of research management. In the first part of the undergraduate research project course, the students are only required to carry out preliminary studies on the assigned chemical and gas engineering related topics but also to do research planning that will be implemented in the following semester. At the end of this course, students should be able to prepare a complete research proposal and subsequently present their proposal. In addition, students will have opportunity to gain

important generic skills such as communication, team working, problem-solving and creative and critical thinking.

SETG 3915 - Industrial Training

Students shall attend industrial training prior to their final year at UTM. Students will undergo a practical training lasting for 12 weeks at an approved private, government or semi-government agency. Placement at the respective agency will be initiated by the applications from the students. Approval of the application is at the discretion of the Faculty after considering the suitability of the company. The industrial training provides an opportunity for students to experience the actual working environment and to be able to put into practice the theories that they learned in class. Undergraduates are expected to acquire hands on experience not only in the engineering aspects of work, but also to other related matters such as administration, accounting, management, safety, etc. during the industrial training period. Students will be supervised by Faculty's supervisor and Industrial's supervisor.

SETG 3731 - Separation Process Laboratory

Pre-requisites: SETG 3473 (taken)

This subject introduces students to the equipment in the separation processes discussed in Separation subject. This will give a 'hands on' experience to the students how to handle the equipments and to interpret the data taken from the experiments. There are also various types of packing and plate in the column (absorption and distillation) that are being used in the laboratory. Comparison can be made on the efficiency of each packing/plate after all the packing/plate types have been used.

SETG 4223 - Gas Storage and Reticulation System

Pre-requisites: SETG 3213 (taken)

This subject enables student to acquire and practice the fundamental knowledge of liquefied petroleum gases (LPG), natural gases (NG) and liquefied natural gases (LNG) storage. The course also emphasizes on gas reticulation systems which include service pipe sizing, pipe route, pressure testing and corrosion protection systems. The students are also required to prepare a group technical report and present their project at the end of the course. Students also will be exposed to computer software (PV Elite and CEASAR II) to enhance their learning quality. A visit to the related industries will also be arranged for them to gain some industrial experience.

SETG 4393 - Engineering Economics and Project Management

This is a two-in-one course covering both Engineering Economy and Project Management topics. Engineering economy is the application of economic factors and criteria to evaluate alternatives, considering the time value of money. The engineering economy study involves computing a specific economic measure of worth for estimated cash flows over a specific period of time. Project Management is the art of planning, scheduling, and controlling project activities to achieve performance, cost, and time objectives, for a given scope of works, while using resources efficiently and effectively.

SETG 4493 - Plant Design

Pre-requisites: SETG 3473 (taken)

This course presents the principles and methodology for product and process design. In particular, it emphasises on the key elements of process design which include process synthesis, heat integration, equipment sizing and cost estimation and process optimisation in generating inherently safe, economic and environmentally friendly processes. The course features the use of process simulation tools.

SETG 4711 - Gas Flow System Laboratory

Pre-requisites: SETG 3213 (taken)

This course is designed to allow students to undergo some laboratory work related to gas engineering courses (SETG 3213 & SETG 4223). At the end of the course, students should be able to practically apply different methods of gas pipeline jointing technique, gas metering calibration, gas pipeline control, metering system and gas reticulation system. The students are required to prepare a group laboratory report. This course also implements an Industrial Project-based lab where the students are required to design and assemble a gas reticulation system that represents an actual industrial operation. In addition, students will have the opportunity to gain important generic skills such as responsibilities, communication, and team working.

SETG 4771 - Process Control Laboratory

Pre-requisites: SETG 3483 (taken)

This lab exposes students to areas of process control systems in the chemical industry. It also teaches the students how to control the specific control variables through the use of simple PID control. Students will experience how to perform open loop and closed loop tuningmethods for specific processes. Also included is the application of PLC program to plan and control a simple process. Students will gain hands-on experience in process control through experiments that employ pilot-scale chemical processes.

SETG 4824 - Undergraduate Project II

Pre-requisites: SETG 3812 (pass with at least D+)

This course is a continuation of the Undergraduate Project I (SETG 3812). The second part of the Undergraduate Project requires students to implement the research proposal that has been prepared in the previous semester. This might involve practical activities such as laboratory works, data collection from industry and computer programming / simulation. At the end of the course, students should be able to prepare a full report compiling the first and second part of the Undergraduate Project and subsequently present their research findings. Finally, students must submit a bound thesis according to the UTM thesis-writing format. In addition, students will have the opportunity to gain important generic skills such as communication, team working, problem-solving and creative and critical thinking.

SETG 4610 - Gas Engineering Seminar

This seminar provides the platform for verbal sharing experience and providing forums of discussion amongst industrialists, academicians and final year gas engineering students. It is expected to prepare the students with current development in the related gas industry operation and activities. The actual industrial operation scenario will be addressed by various

well-verse industrial personnel and experienced engineers. The dialog and presentation would strengthen students' understanding of the current, future and past trend of the gas industry and its relevant applications. It is expected that students would also be able to enlighten the correlation of professional ethics in societal and global context by appreciating the values of resources, latest technological development, issues of health and environment, integrated safety, professional practices and personal integrity.

SETG 4834 - Plant Design Project

Pre-requisites: SETG 4493, SETG 3383 (taken)

This project is aimed at equipping the students with the skills and creativity in designing a process plant in the absence of complete data. In particular, this course emphasizes on the key elements of process design which include process creation/synthesis, process analysis, process evaluation and process optimization in generating inherently safe, economic and environmentally friendly processes. The students will acquire the skill for hands-on application and integration of the principles of chemical engineering required to design a process plant. Students will also learn the technique of writing a comprehensive technical plant design report. The students are also required to present their project at the interim level and end of the course. In this course, students also will be exposed to computer software (ASPEN HYSIS and PV Elite) to enhance their learning quality. The students are also required to do an industrial visit to the related industries to gain some industrial experience and submit an industrial visit report discussing the benefits of the visit.

ELECTIVE COURSES

1. Energy

SETG 4113 - Carbon Capture and Sequestration

This course enables students to examine CO_2 separation and capture technologies and also monitoring and verification. It provides an overview of current technologies and discuss critical technical challenges. Sequestration in geologic formation and sequestration in the oceans using injection methods are clarified. Costs, public acceptance and legal and environmental issues are clarified and factored into the strategy for future energy systems.

SETG 4143 - Energy Management and Economics

This course introduces basic background, terminology, and fundamentals of energy conversion. Discusses current and emerging technologies for production of thermal, mechanical, and electrical energy. Topics include fossil and nuclear fuels, solar energy, wind energy, fuel cells, and energy storage.

SETG 4153 - Energy Conversion Technology

This course introduces basic background, terminology, and fundamentals of energy conversion. It provides a broad conceptual and analytical understanding of the engineering aspects of energy generation, storage and conversion with an emphasis on sustainable energy use and renewable energy production.

SETG 4163 - Green Energy Technology
The aim of the programme is to prepare students for a professional career in the development of advanced technologies and systems that can satisfy energy demand while striving for environmental, social and economic sustainability. In addition to in-depth knowledge of energy technologies and systems, students will be trained to understand the basic challenges of sustainable development, with a specific focus on the challenges that face the energy system. The course is unique in that it deals with the energy system on all relevant systems levels and that the courses are integrated in such a way that students are trained to approach problem solving in an interdisciplinary way. At the end of the course, students will have acquired a thorough insight into the possibilities and limitations of energy systems, specifically in relation to sustainable development.

SETG 4243 - Non-Conventional Oil and Gas Exploitation
This course enables students to describe formation of hydrocarbons, determine exploration methods and techniques, describe fundamentals of drilling and reservoirs, processing of effluent streams, safety and the environment, hydrodynamics of petroleum exploration, characterize the reserves and describe the principle of petroleum economics.

2. Gas

SETG 4173 - Membrane Based Gas Separation Technology
This course introduces students to the fundamentals of gas separation membrane and membrane processes. Students are exposed to membrane materials, morphology, and properties in relation to the gas separation application. In addition, the students will be able to evaluate the productivity and purity of the products under fixed operating conditions from transport equation or supplier information. This subject is also briefly provide the students with the knowledge of potential application of membrane gas separation technology in various industries including petrochemicals, environment and other energy related emerging applications.

SETG 4253 - Gas Production Engineering
This course is designed to expose students to the gas production system. The course contents include a natural gas source, gas well performance, production surface facilities, gas treatment and gas transportation and storage. The course covers the relationship between upstream and downstream activities and the processes involved in the transporting and treating.

SETG 4263 - Fire and Explosion Safety
This course enables students to understand the basic concept of fire science and combustion and related calculations as well as to expose them to the concept of explosion and detonation. In addition, the principles of fire and explosion protection and mitigation will be discussed within the context of understanding the fire and explosion development mechanism. At the end of the course, students should be able to explain and relate the fundamental knowledge of combustion, flame and explosion and its important safety aspects involving gaseous fuel utilization. Students should be able to apply general combustion and engineering principles to fires and explosions and should know the parameters involved in the initiation of both fire and

explosion. The students should be also able to use CFD fire modeling (CFast) to analyze the fire development on the case studies given.

SETG 4273 - Gas Operation and Maintenance

This course is designed to expose students to gas supply operation and maintenance. The course contents include a gas supply system, legislature, maintenance activity, and asset management and control. The course covers pipeline and storage systems.

SETG 4283 - Corrosion Engineering

The aim of this course is to provide basic knowledge of corrosion and corrosion protection of metals and alloys from an electrochemistry perspective. This course is specially designed for students who want to have a basic understanding of the corrosion process. Students will be introduced to the underlying science of corrosion engineering principles, corrosion management with particular emphasis on the corrosion design of pipeline corrosion protection. Different types of corrosion, methods of corrosion protection and prevention standard corrosion tests will be discussed. This course also covers most traditional and non-traditional tests for corrosion studies, including electrochemical techniques for corrosion, analysis of corrosion phenomenon and corrosion monitoring principles. This course will examine the general mechanisms of corrosion and relate these to specific engineering issues and methods being used to reduce the cost of corrosion. At the end of the course students will be required to do a case study on corrosion problems that shall introduce students on real corrosion problems in industries and group projects allow students to become familiar with directing their own investigations of corrosion problems.

BACHELOR OF NUCLEAR ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Nuclear Engineering with Honours is offered on a full-time basis. The programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on a full-time basis and is based on two semesters per academic session. Generally, students are expected to undertake courses equivalent to between twelve (12) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Nuclear Engineering with Honours	
4. Final Award			Bachelor of Nuclear Engineering with Honours	
5. Programme Code			SETNH	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Malaysia	
8. Mode of Study			Conventional	
9. Mode of operation			Self-govern	
10. Study Scheme			Full Time	
11. Study Duration			Minimum : 4 years Maximum : 6 years	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	14	-
Short	4	-	8	-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (a) General (b) Language (c) Entrepreneurship (d) Co-Curriculum	 10 8 2 3	16.6%
ii.	Faculty/ Programme Core	110	79.1%
iii.	Programme Electives	6	4.3%
	Total	**139**	**100%**
A	Engineering Courses (a) Lecture (b) Laboratory/ Workshop (c) Industrial Training (d) Final Year Project (e) Integrated Design Project	 74 6 5 6 4	68.3%
Total Credit Hours for Part A		**95**	
B	Related Courses (a) Applied Science/ Mathematics/ Computer (b) Management/ Law/ Humanities/ Ethics/ Economy (c) Language (d) Co-Curriculum	 18 12 8 3	31.7%
Total Credit Hours for Part B		**44**	
Total Credit Hours for Part A and B		**139**	**100%**
Total Credit Hours to Graduate		**139 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 139 credit hours with a minimum CGPA of 2.00.
- Pass Industrial Training.
- Complete all Professional Skill Courses.

CROSS-CAMPUS PROGRAMME

Students are given the opportunity to enrol in a few courses in participating universities. The grades and credits obtained during this period are transferable (up to 1/3 of the total credits of the curriculum). Currently, there are four participating universities i.e. Universiti Teknologi Malaysia, Universiti Sains Malaysia, Universiti Malaya and Universiti Malaysia Sarawak.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

(i) The total number of credits allowed to be taken is between twelve (12) and sixteen (16) credits only.
(ii) The student should hold a minimum CGPA of 3.00 at the time of application.
(iii) The student is not a residence of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However, should the participating university provide accommodation, the student will need to pay accommodation fees.

COURSE MENU

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETN 1113	Modern Physics	3	
SETN 1143	Introduction to Engineering	3	
SETN 1243	Statics[@]	3	
SSCE 1693	Engineering Mathematics I[@]	3	
UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students Only)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation Ethics and Civilizations (for International Students)		
UHLB 1112	English Communication Skills	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**16**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETN 1133	Engineering Drawing	3	
SETN 1123	Fluid Mechanics[@]	3	
SETN 1224	Electrical Engineering Fundamentals with Laboratory	4	
SETN 2213	Nuclear Physics	3	SETN 1113#
SSCE 1993	Engineering Mathematics II[@]	3	SSCE 1693
UHIS 1022	Philosophy and Current Issues (for Local Students)	2	

UHLM 1012	Malay Language Communication 2 (for International Students)		
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**34**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECP 2273	Programming for Engineers	3	
SETN 1711	Fluid Mechanics Lab	1	SETN 1123
SETN 2113	Thermodynamics@	3	
SETN 2123	Strength of Materials	3	
SETN 2243	Nuclear Engineering Fundamentals	3	
SSCE 1793	Differential Equations	3	SSCE 1993
UHLB 2122	Academic Communication Skills	2	UHLB 1112
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**52**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETN 2133	Dynamics@	3	SETN 1243
SETN 2223	Heat Transfer	3	SETN 2113#
SETN 2393	Numerical Methods for Nuclear Engineers	3	SSCE 1793
SETN 2711	Thermodynamics & Mechanics of Material Laboratory	1	SETN 2113 SETN 2123
SETN 3711	Nuclear Physics Lab	1	SETN 2213
SSCE 2193	Engineering Statistics	3	
UHMT1012	Graduate Success Attributes	2	
UKQF 2**2	Co-curriculum	2	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**70**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETN 3173	Engineering Economics & Project Management	3	
SETN 3213	Nuclear Reactor Theory	3	
SETN 3233	Radiation Detection and Measurement	3	
UBSS 1032	Introduction to Entrepreneurship	2	
UHIT 2302	The Thought of Science and Technology	2	
UHLB 3132	Professional Communication Skills	2	UHLB 2122
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**86**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETN 3113	Nuclear Radiation Protection	3	
SETN 3123	Nuclear Reactor Material	3	SETN 2123
SETN 3223	Instrumentation and Control Engineering	3	
SETN 3224	Thermal Hydraulics with Lab	4	SETN 2223 SETN 1123
SETN 3721	Nuclear Reactor Lab	1	SETN 3213
SETN 4812	Undergraduate Project I	2	
UHL* 1112	Foreign Language Elective	2	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**104**	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SETN 3915	Industrial Training	5	
	TOTAL CREDIT	**5**	
	CUMULATIVE CREDITS	**109**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETN 3253	Nuclear Safety, Safeguard, Security & Regulation	3	
SETN 4453	Nuclear Power Plant System	3	
SETN 4711	Radiation, Detection & Measurement Lab	1	SETN 3233
SETN 4824	Undergraduate Project II*	4	SETN 4812#
SETN 4833	Nuclear Engineering System and Design I	3	SETN 4453
SETN 4**3	Elective I	3	
SET* 5**3	PRISMS Elective I		
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**126**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETN 4611	Nuclear Engineering Professional Practice**	1	
SETN 4834	Nuclear Engineering System and Design II	4	SETN 4833
SETN 4113	Nuclear Fuel Cycle and Waste Management	3	
SETN 4**3	Elective II	3	
SET* 5**3	PRISMS Elective II		
U*** 2**2	University Elective (Generic Skill Cluster)	2	
	TOTAL CREDIT	**13**	
	CUMULATIVE CREDITS	**139**	

Note: * - cornerstone course; ** - capstone course; @ - with tutorial
- must pass (at least with grade D+) for prerequisite course

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

*Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

Elective Courses

- SETN 4413 Sustainable Energy
- SETN 4423 Ultrasonic Testing
- SETN 4433 Chemistry in Nuclear Engineering
- SETN 4443 Risk Assessment
- SETN 4483 Radiographic Testing

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the courses are not allowed to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
NUCLEAR ENGINEERING COURSES					
1	SECP 2273	Programming for Engineer	3	3	
2	SETN 1113	Modern Physics	3	3	
3	SETN 1123	Fluid Mechanics	3	3	
4	SETN 1133	Engineering Drawing	3	3	
5	SETN 1143	Introduction to Engineering	3	3	
6	SETN 1224	Electrical Eng. Fundamental with Lab	4	4	
7	SETN 1243	Statics	3	3	
8	SETN 1711	Fluid Mechanics Lab	1	1	
9	SETN 2113	Thermodynamics	3	3	
10	SETN 2123	Strength of Materials	3	3	
11	SETN 2133	Dynamics	3	3	
12	SETN 2213	Nuclear Physics	3	3	
13	SETN 2223	Heat Transfer	3	3	
14	SETN 2243	Nuclear Engineering Fundamentals	3	3	
15	SETN 2393	Numerical Methods for Nuclear Engineers	3	3	
16	SETN 2711	Thermodynamics & Mechanics of Material Lab	1	1	
17	SETN 3113	Nuclear Radiation Protection	3	3	
18	SETN 3123	Nuclear Reactor Materials	3	3	
19	SETN 3173	Engineering Economics & Project Management	3	3	
20	SETN 3213	Nuclear Reactor Theory	3	3	
21	SETN 3223	Instrumentation and Control Eng.	3	3	

22	SETN 3224	Thermal Hydraulics with Lab	4	4	
23	SETN 3233	Radiation Detection and Measurement	3	3	
24	SETN 3253	Nuclear Safety, Safeguard, Security & Regulation	3	3	
25	SETN 3711	Nuclear Physics Lab	1	1	
26	SETN 3721	Nuclear Reactor Lab	1	1	
27	SETN 3915	Industrial Training	5	HL	
28	SETN 4113	Nuclear Fuel Cycle & Waste Management	3	3	
29	SETN 4453	Nuclear Power Plant System	3	3	
30	SETN 4611	Nuclear Eng. Professional Practice	1	1	
31	SETN 4711	Rad. Detection & Measurement Lab	1	1	
32	SETN 4812	Undergraduate Project I	2	2	
33	SETN 4824	Undergraduate Project II	4	3	
34	SETN 4833	Nuclear Eng. System & Design I	3	3	
35	SETN 4834	Nuclear Eng. System and Design II	4	4	
36	SETN 4**3	Elective Nuclear I	3	3	
	SET* 5**3	PRISMS Elective I			
37	SETN 4**3	Elective Nuclear II	3	3	
	SET* 5**3	PRISMS Elective II			
		TOTAL CREDIT OF NUCLEAR ENGINEERING COURSES (a)	**104**	**99**	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
		TOTAL CREDIT OF MATHEMATICS COURSES (b)	**12**	**12**	

UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHMS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			
2	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language Communication 2 (for International Students)			
Cluster 2: Generic Skills					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	U*** 2**2	University General Elective	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT 2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQF 2**2	Co-Curriculum	2	2	
2	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHL* 1112	Foreign Language Elective	2	2	
Cluster 6: Entrepreneurial Skills					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**23**	**23**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**139**	**134**	

OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC). ● **Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.** ● **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**		
COMPULSORY PSC COURSES (Enroll All 3 Courses)		
1	GLRB0010	Design Thinking for Entrepreneur
2	GLRM0010	Talent and Competency Management
3	GLRL0010	English Communication Skills for Graduating Students (ECS)
ELECTIVE PSC COURSE (Choose 2 Only)		
1	GLRT0010	Data Analytics for Organization
2	GLRM0020	Professional Ethics and Integrity
3	GLRT0020	Construction Measurement (Mechanical & Electrical)
4	GLRT0030	OSHE for Engineering Industry and Laboratory
5	GLRT0040	OSHE for Construction Industry and Laboratory Works
6	GLRT0050	Quality Management for Build Environment and Engineering Professionals
7	GLRT0060	Safety and Health Officer Introductory Course
		More elective courses to be added in future

COURSE SYNOPSIS

CORE COURSES

SETN 1143 - Introduction to Engineering

The objective of this course is to introduce and prepare students for learning engineering and how to become engineers of the future. This course serves to bridge pre-university education to university life and provide support for adjusting to learning and expectations in tertiary education. This course introduces the students to the engineering profession, how to prepare for an exciting engineering career, the design process, engineering communication, thinking skills and ethics. The students will also be introduced with systematic approaches to deal with basic engineering problems. Special emphasis will be on enhancing students' communication skills. Problem-Based Learning (PBL) case study on sustainable development will be implemented for a mini project consisting of three stages.

SETN 1113 - Modern Physics

The course begins with a brief discussion on the nature of science in the quest of better understanding of the natural phenomena, the inadequacy and failures of classical physics. It is then followed by an introductory lesson on Special Relativity Theory and relevant consequences of this theory. A modern quantum mechanics interpretation on blackbody radiation, photoelectric and Compton effect will also be discussed. It will then proceed to the lesson on atomic models and quantum numbers. Finally, formalities of quantum mechanics are introduced by discussing the 1-D time independent Schrodinger equation (TISE), applied to an idealized infinite square potential well.

SETN 1243 - Statics

This course is designed to introduce students to the basic principles and concepts in mechanics. It deals with the resultant and resolution of force(s) acting on a particle, the equilibrium of a particle, the effect of force(s) on rigid bodies, how to replace a force system with an equivalent system and the equilibrium of rigid bodies. This course also includes the determination of centroid, analysis of structure and friction. At the end of the course, students should be able to demonstrate and apply the knowledge by solving various problems in Statics, which forms the basis of further engineering subjects especially Mechanics of Materials and Fluid Mechanics.

SETN 2213 - Nuclear Physics

Pre Requisite: SETN 1113 (pass with at least D+)

The course introduces some major concepts and theories of nuclear physics. The course begins with understanding the basic knowledge of the constituents of nucleus and the properties of nuclear forces. Nuclear models such as liquid drop model, shell model and optical model of the nucleus will be introduced afterward. The next topic of the course is introducing the radiation sources and the types of ionizing radiations. Nuclear decay process and the properties of ionizing radiation will be discussed in this topic. The interactions of nuclear radiations with matter and mechanism of nuclear reaction are also covered in this subject. The next topic is providing the students with some basic concepts on radioactivity including radioactive decay law, radioactive decay series and radioactive equilibriums. In general, the

course provides a basic concept of interaction processes of nuclear radiation in order to widen the appreciation of nuclear physics to the students.

SETN 1123 - Fluid Mechanics

This course introduces students to physics of fluid: what is fluid, some definitions, surface tension, compressible and Incompressible flow, classes of flow, and physical classification. Fluid statics: pressure, differential equations of fluid statics, manometry, fluid force on submerged bodies, buoyancy and stability of floating bodies, and liquid in relative equilibrium. Fluid in motion: continuity equation, energy and mass equilibrium, Euler, Bernoulli and Momentum equations. Friction in fluid flow: velocity profile in pipes, roughness, friction factor, Moody chart. Flow measurement: venturi and pitot tube, orifice, notches and weirs. Pump and pumping: principle, types, selection, and application of pumps. Dimensional analysis, similitude in fluid mechanics, parameters of incompressible and compressible flow.

SECP 2273 - Programming for Engineers

This course formally introduces the concept of computers, algorithms, programming languages, pseudocode, and problem solving. The two programming languages introduced in this course are Fortran and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting, and model building.

SETN 1224 - Electrical Engineering Fundamentals with Lab

This course introduces students to the fundamentals of electrical and electronic engineering through lecture and laboratory sessions. It covers components (passive, active, semiconductor-based), circuits (AC, DC, analogue, digital) and the methods for analyzing circuitry. The laboratory sessions reinforce students' understanding of the theory and expose them to electronics test and measurement equipment. At the completion of this course students are expected to be able to understand electrical and electronic engineering, draw and analyze electronic circuits, use test and measurement instruments, and design basic analogue and digital electronic circuits using active and passive components.

SETN 2243 - Nuclear Engineering Fundamentals

This course introduces students to the fundamentals of nuclear engineering. The course provides a broad overview of the fundamental aspects of nuclear engineering and an introductory comparative analysis of nuclear power and other energy sources. The course also provides comparative analysis between different types of nuclear reactors. Other topics covered include theory and thermal hydraulics of nuclear reactors, nuclear power generations, nuclear fuel cycle and control, Radiation and radiation control and nuclear safety.

SETN 2123 - Strength of Materials

The first part of this course is introductory to Materials Engineering. Topics include classification of materials (metals, ceramics, polymers, composites and semiconductors); atomic bonds; crystal structure; crystalline defects and solid solutions; and phase diagrams. Main emphasis is on metals because metals are structurally the simplest tocharacterize and a sound knowledge of structure-property relation of metals can be extendedto the study of ceramics and polymers. The second part of the course deals with Mechanics

of Materials. Topics cover stress and deformation of members under axial loading, torsion in circular shafts, analysis and design of beams for bending, and stress transformation. Throughout the course, strong emphasis is placed on drawing a free-body diagram, selecting appropriate coordinate systems, and using the correct sign convention.

SETN 2113 - Thermodynamics

Thermodynamics is a fundamental engineering subject where thermodynamic system, boundaries, mass, heat, work, internal energy and enthalpy are explained. Properties of common fluid, such as water, air, and refrigerants are determined either using tables of properties or equations. These are then related to the concepts of 1st Law of Thermodynamics for energy balance calculation and analysis. To further analyze whether a process is possible or not requires a knowledge of 2nd Law of Thermodynamics where another thermodynamic property known as entropy is introduced. All these concepts are then applied to more integrated and complex power and refrigeration cycle systems.

SETN 1133 - Engineering Drawing

This course provides a fundamental background in engineering drawing to the students, which will enable them to work more effectively in the various fields of engineering. This course aims at developing the skills needed for documenting designs using drawings and for performing graphical analysis of two dimensional and three-dimensional problems. The students will be exposed to different available CAD for engineering drawing with more emphasis on the utilization of QCAD and AutoCAD software. This course focuses on the introduction to engineering drawing, fundamentals of engineering drawing, geometry, orthographic and isometric drawing. This course also introduces the sectional and flowchart drawing and computer aided engineering drawing to the students. Besides that, this course also provides the basic skills and concept on the technical drawing of the gas engineering related Piping & Instrumentation Diagram (P&ID) that is essential for process industries.

SETN 1711 - Fluid Mechanics Lab

Pre Requisite: SETN 1123 (taken)

This laboratory course contains 7 experiments that cover basic concepts in Fluid Mechanics. Laboratory experiments are designed for hands-on experience to understand the engineering principles. The experiment includes Flow Measurement, Bernoulli's Principles, Stability of Floating Body, Jet Impact, Forced Vortex Flow, Minor and Major Losses in Pipes. This course also emphasizes the technical writing aspect where all students' observations and arguments of each experiment must be reported in proper format.

SETN 2393 - Numerical Methods for Nuclear Engineers

This course formally introduces the steps involved in engineering analysis (mathematical modeling, solving the governing equation, and interpretation of the results). Examples of case studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and Monte Carlo method are introduced.

SETN 2223 - Heat Transfer

Pre Requisite: SETN 2223 (pass with at least D+)

In this course, three basic modes of heat transfer, namely conduction, convection and radiation, will be covered. Emphasis will be on developing a physical and analytical understanding of the three modes of heat transfer, as well as its applications. Students will develop an ability to apply governing principles and physical intuition to solve single and multi-mode heat transfer problems for one or two-dimensional systems of either steady or transient state. This course also introduces methods for calculating rates of heat transfer by these three modes. The concepts of thermal resistance networks will be developed for the analysis of heat flows.

SETN 2133 - Dynamics

Pre Requisite: SETN 2133 (taken)

This course is designed to introduce students to the second part of mechanics which deals with the analysis of particles and bodies in motion. It will include the kinematics and kinetics of particles. It will cover the rectilinear and curvilinear motion of particles, Newton's second law of particles, and work and energy for particles. At the end of the course, students should be able to demonstrate and apply the knowledge by solving various problems involving kinematics and kinetics of particles and kinematics of rigid bodies, which forms the basis of further engineering courses.

SETN 2711 - Thermodynamics & Mechanics of Material Lab

Pre Requisite: SETN 2113 and SETN 2123 (taken)

This laboratory course contains 6 experiments that covered basic concepts in Thermodynamics and Strength of Material. Laboratory experiments are designed for hand-on experience to understand the engineering principles. The experiment application includes the First Law of Thermodynamics, Second Law of Thermodynamics, Properties of Pure Substance and Properties and Strength of Materials. This course also emphasizes the technical writing aspect where all students' observations and arguments of each experiment must be reported in proper format.

SETN 3233 - Radiation Detection and Measurement

The important detection techniques for radiation are introduced in this course. The discussion begins with introducing the principles of radiation detection related to radiation units, radiation sources and radiation interactions. Nuclear radiation detector parameters such as detector model, detector efficiency, energy resolution, counting curve and counting statistics are discussed. The next topic will emphasize on the principles of operation and basic characteristics of various detection systems. Various nuclear detectors such as gas filled detector, scintillation detector and semiconductor detector are main concerns of the subject. The course also emphasizes on the principle and operation of thermal and fast neutron detectors. The principle of radiation dosimetry such as thermolumeniscent dosimetry, chemical dosimetry, film dosimetry and calorimeter are also discussed at the end of the course.

SETN 3113 - Nuclear Radiation Protection

This course is designed to ground students in the principles of radiation protection, that is, on justification, optimization and dose limits. It will emphasize on the theories, the techniques and the procedures for external dose control that is the use of distance, shielding and time; and internal dose control, including introduction to the physics of aerosol, use of unsealed sources, primary and secondary containments, radioactive laboratories and leak tests. The course will also discuss organization and radiation protection programmes; emergency procedures, monitoring, radiological protection in radiation devices, transport regulations and radioactive waste management. Upon completion, students should have an overall grasp of the radiation protection principles and practice; and most importantly the safety culture required**.**

SETN 3213 - Nuclear Reactor Theory

The course starts with discussion on neutron physics related to production, absorption and scattering of neutrons, neutron cross sections and nuclear fission. The next topics will emphasize on the principle of neutron moderation and neutron multiplication leading to steady state fission reactor core design based on diffusion theory. The next topic will emphasize on the reactor equation solutions of neutron flux, maximum to average flux and power for rectangular, cylindrical and spherical reactors. In general, the course provides on the general concepts of neutron physics and its application in nuclear reactors for energy generation. The course will solve the point reactor dynamic equation and apply safety characteristics using point kinetics models.

SETN 4453 - Nuclear Power Plant System

The degree program in Nuclear Power Plant System Engineering comprises a wide range of power engineering titles aimed at theoretical and practical exposure. This program has been developed to train highly qualified professionals to design, operate and maintain power plants. Students are required to describe sources of energy and types of power plants. The analysis of different types of steam cycles and estimation of the efficiencies in a steam power plant will be carried out. The basic working principles of gas turbine and diesel engine power plants are also described in terms of the performance characteristics and components of such power plants. Evaluation on cycle efficiency and performance of a gas cooled reactor power plant are included in this course by listing the different types of fuels used in power plants and estimating their heating values. Further, the calculation on the present worth depreciation, cost of different types of power plants and estimation on the cost of producing power per kW will be done.

SETN 3711 - Nuclear Physics Lab

Pre Requisite: SETN 2213 (taken)

The course covers eight nuclear physics-related experiments. Experiments of health physics and radiation safety are performed and laboratory reports are written by students. Experiments are performed at UTM. Topics of experiment include: 1. Geiger Muller Tube detector, 2. Resolving time 3. Counting statistics, 4. Linear absorption coefficient and inverse square law, 5. Attenuation of betas in aluminium, 6. Limitation of dose system, 7. Absolute efficiency of Geiger Muller.

SETN 3223 - Instrumentation and Control Engineering

This course introduces students to the concept of electrical measurement using analogue and digital instruments, methods for mathematical model building of physical systems and processes, control systems and the use of software in analyzing system and controller performance. Transducers that are used in instruments for measuring common parameters such as temperature and pressure are presented. Instrumentations used in nuclear facilities such as nuclear reactors are covered. This course will also show students the methods to obtain mathematical models of actual physical systems such as electrical, mechanical, thermal, and nuclear systems. Further the fundamental ideas and structures of control systems such as open loop and feedback controls, transfer functions, block diagrams, and controller responses will be covered. The use of transfer functions for controller construction and analysis of controller performance in time domain using MATLAB and Simulink will also be introduced.

SETN 3224 - Thermal Hydraulics with Lab

Pre Requisite: SETN 1123 and SETN 2223 (taken)

This course covers the thermo-fluid dynamic phenomena and analysis methods for conventional and nuclear power stations. Fundamental processes of heat generation and transport in nuclear reactors. Effects of boiling and critical heat flux. Fundamentals of reactor thermal and hydraulic design. Specific topics include: kinematics and dynamics of two-phase flows, boiling, and critical conditions, single channel transient analysis, loop analysis including single and two phase natural circulation, and sub-channel analysis. Students will also perform laboratory experiments to reinforce understanding of thermal hydraulic phenomena.

SETN 3721 - Nuclear Reactor Lab

Pre Requisite: SETN 3213 (taken)

A series of nuclear reactor related experiments are performed in Malaysia Nuclear Agency (MNA) research facilities. The students will be given hands-on experience in dealing with nuclear reactor systems and instrumentation. Students will carry out experiments on site and are required to prepare technical reports for each experiment.

SETN 3123 - Nuclear Reactor Materials

Pre Requisite: SETN 2123 (taken)

This course will provide a valuable insight on some of the key issues facing the nuclear power generation industry. Many of these are related to the materials involved, their response to, and their reliability under extreme conditions. The effects of radiation on various properties of materials in nuclear applications will be dealt with to get an appreciation of the materials' limitations on the operation of reactors. Students will first be introduced to the basic concepts of materials science. The basic aspects of the nuclear fuel cycle, current and future nuclear reactor designs, and the materials problems associated with nuclear energy production will be discussed. The key issues in materials failures and the requirements for efficient and safe operation of current reactor designs as well as design of novel materials for future reactors will be discussed. A few applications of radiation effects will then be treated with this newfound framework, including the change of material properties under irradiation, void swelling, embrittlement and loss of ductility. At the end of this course, students will be familiar with the basic issues concerning the selection of materials for various components in nuclear reactors.

SETN 4812 - Undergraduate Project I

This course is designed to train students on the important aspects of research management. Students will be assigned to a nuclear engineering related topic and required to prepare a research proposal that will be implemented in the following semester. At the end of this course, students should be able to present their proposal. In addition, students will have the opportunity to gain important generic skills such as communication, team working, problem-solving and creative and critical thinking.

SETN 3915 - Industrial Training

This course is a core course which will assign students to industries, governments or semi-governments agencies and organizations for a period of 12 weeks. The training aims to expose students to real nuclear engineering practices while enhancing their knowledge and working experiences as well as improving their interpersonal skills. The students also have the opportunities to apply learned theories into real nuclear engineering practices. Students will be supervised by the faculty and industrial supervisors.

SETN 4824 - Undergraduate Project II

Pre Requisite: SETN 4812 (pass with at least D+)

This course is a continuation of the Undergraduate Research Project I (SETN 4812). The second part of the Undergraduate Research Project requires students to implement the research proposal that has been prepared in the previous semester. This might involve practical activities such as laboratory works, data collection from industry and computer programming / simulation. At the end of this course, students should be able to prepare a full report compiling the first and second part of the Undergraduate Research Project and subsequently present their research findings. Finally, students must submit a working paper and a bound thesis according to the UTM thesis-writing format. In addition, students will have the opportunity to gain important generic skills such as communication, problem-solving and creative and critical thinking.

SETN 4113 - Nuclear Fuel Cycle and Waste Management

This course consists of two parts: Nuclear Fuel Cycle and Waste Management. The first part introduces students to the front-end of the fuel cycle: ore extraction, conversion and enrichment, fuel fabrication and use in the power plant, and spent fuel reprocessing. In the second part, the back-end of the fuel cycle will be discussed. It includes the radioactive waste management, ranging from waste characteristics, waste treatment technologies, radioactive materials transportation and decontamination and decommissioning related to radioactive e processes and materials. At the successful completion of this course the students will be able to describe the following features of a Nuclear Fuel Cycle and Waste Management: Nuclear fuel resources, Uranium enrichment, Nuclear fuel fabrication, Spent fuel storage, Nuclear fuel reprocessing, Waste disposal, Radioactive materials transportation, and Decontamination and decommissioning.

SETN 3173 - Engineering Economics & Project Management

This is a two-in-one course covering both Engineering Economy and Project Management topics. Engineering economy is the application of economic factors and criteria to evaluate alternatives, considering the time value of money. The engineering economy study involves

computing a specific economic measure of worth for estimated cash flows over a specific period of time. Project Management is the art of planning, scheduling, and monitoring of project activities to achieve performance, cost, and time objectives, for a given scope of work,while using resources efficiently and effectively.

SETN 4833 - Nuclear Engineering System and Design I
Pre Requisite: SETN 4453 (taken)
This course introduces students to nuclear engineering systems, particularly nuclear reactors and their systems, subsystems, and major components. It also introduces students to systematic engineering design approaches including needs definition, concept generation and selection, technical specifications, and design trade-offs. With respect to nuclear reactor design, the course focuses on core design, safety systems, fuel elements, and cooling systems. Students will be introduced to software packages for thermal hydraulics and core design, particularly MCNP code. Economics and financial aspects in the design of nuclear systems will also be introduced. This course is also aimed at preparing students with good knowledge and understanding of nuclear systems design.

SETN 3253 - Nuclear Safety, Safeguard, Security & Regulation
This course introduces students to safety, safeguards, security and regulations pertaining to nuclear activities. The focus of the course is on administrative and technical approaches to enhance nuclear safety, national and international safeguard regimes, and security measures to ensure safe use of nuclear technologies. National and international legal instruments and agencies will be introduced. Engineered and inherent safety features, reliability enhancement through redundancy, methods of safety and risk analysis such as probabilistic safety analysis, fault tree and event trees, FMEA will be covered. Students are expected to develop understanding on the importance of nuclear safety, security, safeguards and the legal instruments that are in place to ensure conformance to peaceful uses of nuclear technology.

SETN 4711 - Radiation, Detection & Measurement Lab
Pre Requisite: SETN 3233 (taken)
The course covers seven nuclear experiments. Experiments of radiation detection and measurement are performed and laboratory reports are written by students. Topics of the experiment include energy calibration of detector, resolution of detector, efficiency calibration of detector, gamma spectroscopy, radon measurement, alpha spectrometry, and liquid scintillation.

SETN 4834 - Nuclear Engineering System and Design II
Pre Requisite: SETN 4833 (taken)
This capstone course is a group design project, with a nuclear industrial based case, involving integration of knowledge in nuclear physics, neutron transport, heat transfer, safety, materials, environmental impact and economic analysis. It provides opportunities to synthesize knowledge acquired in nuclear engineering and apply this knowledge to complex problems of current interest in nuclear power plant design. Students are required to present an interim design project, final design presentation and submit the final design report.

SETN 4611 - Nuclear Engineering Professional Practice

This course emphasizes the nuclear engineering ethics and engineer's responsibilities towards safety, health and welfare of the public from a professional point of view. Few speakers from nuclear-related areas such as from Agensi Nuklear Malaysia (ANM), Malaysian Nuclear Power Corporation (MNPC), and Atomic Energy Licencing Board (AELB) will be invited to give talks to the students. The talks will place emphasis on the engineer as a professional man, engineers in society, code of ethics and professional conducts, standards, laws and regulations pertaining to professional engineering practice. At the end of this course, students will acquire the concept of professionalism and ethical responsibility and be able to demonstrate and apply engineering professional ethics in their career as an engineer.

ELECTIVE COURSES

SETN 4483 - Radiographic Testing

This course describes Non-Destructive Testing (NDT) which is the process of inspecting, testing or evaluating materials, components or assemblies for discontinuities without destroying their serviceability. The course introduces the six most common NDT methods which are Visual Testing, Liquid Penetrant Testing, Magnetic Particle Testing, Radiographic Testing, Ultrasonic Testing and Eddy Current Testing. Emphasis will be given to Radiographic Testing which is also known as Industrial Radiography. Metal forming and manufacturing processes and possible defects present in each process will be described. The most widely used industry inspection and acceptance standards for NDT such as ASME V, VIII and API 1104 will be described.

SETN 4413 - Sustainable Energy

In the context of depleting fossil fuel reserves and environmental consequences, the concept of sustainable energy warrants to be a contemporary subject matter. This course explains the concepts of sustainable energy technology based on ethics, environments and economy (E^3) and the role of sustainability in practical system applications and innovation. The course recognizes the effects from the fossil dominated energy systems over economics, environment and society. The course provides the latest review of the most important renewable energy resources, advanced technologies, and explains the sustainability basis for harnessing them. The course also demonstrates evaluating the energy technologies and systems to be economically feasible, environmentally bearable and socially acceptable. Comprehension of the issues associated with sustainable energy technology are achieved through lectures, discussions, combined with reports and student presentations on the literature reviewed.

SETN 4423 - Ultrasonic Testing

The course starts with the introduction of the underlying science of ultrasonic and acoustic wave propagation in elastic media, and its application to non-destructive evaluation. Students will be introduced to the mathematical equations that govern the propagation of ultrasonic and acoustic waves. The student will be exposed to different ultrasonic probes, their types and construction. This is followed by calibration of the testing device and sensitivity adjustment. The theoretical material will be covered in a number of illustrated lectures, reinforced by worked example classes. In parallel with the theoretical aspect of the course, students will undertake a number of experimental tasks to demonstrate how the theory translates into

practice. In general, these tasks will be drawn from examples from the field of non-destructive evaluation, using standard industrial procedure.

SETN 4433 - Chemistry in Nuclear Engineering

The subject focuses on the chemistry aspects of nuclear engineering. The physico-chemical properties in radioactivity and binding energy are presented in this course. The occurrence of radionuclide in nature as well as the stability and radioactivity of the radionuclides are evaluated. The chemical effects of radiation on the radiolysis of various organic and inorganic matters are also discussed. The production and separation methods of radionuclides and their chemical behaviors are also covered in this course. The applications of these radionuclides in qualitative and quantitative chemical analysis are included. This course also discusses the production of hydrogen gas as alternative fuel using nuclear energy. The final part of this course deals with the emerging application of nuclear reaction for transmutation of elements and isotopes.

SETN 4443 - Risk Assessment

Fundamental safety principles in the nuclear industry require assessment of safety for all facilities and activities that potentially give rise to radiation risks. Safety assessment in particular is a systematic process that is carried out to ensure that all safety requirements are met. This course addresses the fundamental aspects of safety assessment providing the basis for specialized training in the area of deterministic and probabilistic safety assessments. This course also discusses safety assessment of main system design that include reactor core, coolant and containment system. It provides for introductory and preparatory knowledge necessary for engineers and regulatory personnel engaged in safety

BACHELOR OF PETROLEUM ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Petroleum Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at UTM Kuala Lumpur Campus and in Miri, Serawak. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a two semesters per academic session. Generally, students are expected to undertake courses equivalent to between twelve (12) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Petroleum Engineering with Honours	
4. Final Award			Bachelor of Petroleum Engineering with Honours	
5. Programme Code			SETPH	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study			Conventional	
9. Mode of operation			Self-govern	
10. Study Scheme			Full Time	
11. Study Duration			Minimum : 4 years Maximum : 6 years	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	14	-
Short	4	-	8	-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (a) General (b) Language (c) Entrepreneurship (d) Co-Curriculum	 10 8 2 3	16.6%
ii.	Faculty/Programme Core	110	79.1%
iii.	Programme Electives	6	4.3%
	Total	**139**	**100%**
A	Engineering Courses (a) Lecture/Project/Laboratory (b) Workshop/Field/Design Studio (c) Industrial Training (d) Final Year Project	 74 7 5 6	67.6%
	Total Credit Hours for Part A	**92**	
B	Related Courses (a) Applied Science/ Mathematic/ Computer (b) Management/Law/Humanities/Ethics/Economy (c) Language (d) Co-Curriculum	 21 12 8 3	32.4%
	Total Credit Hours for Part B	**47**	
	Total Credit Hours for Part A and B	**139**	**100%**
	Total Credit Hours to Graduate	**139 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 139 credit hours with a minimum CGPA of 2.0.
- Pass Industrial Training
- Complete all Professional Skills Certificate (PSC)
- Students from other approved programmes who wish to undertake a Minor in the programme must complete not less than 15 credit hours of specialized Chemical

engineering courses which form part of the core and/or electives of the programme, as listed in the minor programme list.

CROSS-CAMPUS PROGRAMME

Students are given the opportunity to enrol in a few courses in participating universities. The grades and credits obtained during this period are transferable (up to 1/3 of the total credits of the curriculum). Currently, there are four participating universities i.e. Universiti Teknologi Malaysia, Universiti Sains Malaysia, Universiti Malaya and Universiti Malaysia Sarawak.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

(i) The total number of credits allowed to be taken is between twelve (12) and sixteen (16) credits only.
(ii) The student should hold a minimum CGPA of 3.00 at the time of application.
(iii) The student is not a residence of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However, should the participating university provide accommodation, the student will need to pay accommodation fees

COURSE MENU

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 1693	Engineering Mathematics 1	3	
UHLB 1112	English Communication Skills	2	
UHIS 1022	Philosophy and Current Issues (Local Students)	2	
UHLM 1012	Malay Language Communication 2 (for International Students)		
SSCK 1203	Analytical Chemistry for Engineers	3	
SETP 1313	Introduction to Petroleum Engineering*	3	
SETP 1113	Engineering Mechanics	3	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**16**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
UHMT 1012	Graduate Success Attributes	3	
SSCE 1793	Differential Equations	2	SSCE 1693#
UHMS 1182	Appreciation Ethics and Civilizations (for Local Students)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR		

	Appreciation Ethics and Civilizations (for International Students)		
SETP 1123	Fluid Mechanics*	3	
SETP 1133	Engineering Drawing	3	
SETP 2113	Thermodynamics	3	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**32**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
UHLB 2122	Academic Communication Skills	2	ULEA 1112
UHL* 1112	Foreign Language Elective	2	
SCSP 1103	Programming Technique I	3	
SSCE 1993	Engineering Mathematics II	3	SSCE 1693#
SEEU 2003	Electrical Technology	3	
SETP 2213	Basic Geosciences*	3	
SETP 2721	Geosciences Lab	1	SETP 2213
SETP 1711	Fluid Mechanics Lab.	1	SETP 1123
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**50**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 2193	Engineering Statistics	3	SSCE 1693#
SETP 2123	Mechanics of Materials	3	SETP 1113#
SETP 2313	Reservoir Rock and Fluids Properties*	3	
SETP 2731	Thermodynamics & Mechanics of Material Lab.	1	SETP 2123, SETP 2113#
UHIT 2302	The Thought of Science and Technology	2	
U*** 2**2	University General Elective (Soft Skills Cluster)	2	
UBSS 1032	Introduction to Entrepreneurship	2	
UKQF 2**2	Co-curriculum & Service Learning	2	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**68**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 2393	Numerical Methods	3	SSCE 1693#
SETP 3413	Drilling Engineering*	3	
SETP 3741	Drilling Fluid Lab.	1	SETP 3413
SETP 3213	Formation Evaluation	3	
SETP 3313	Reservoir Engineering*	3	SETP 2313#
SETP 3731	Reservoir Engineering Lab.	1	SETP 3313

SETP 3921	Geology Field Work[@]	1	SETP 2213#
UHLB 3132	Professional Communication Skills	2	ULEA 2122
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**86**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETP 3423	Well Completion	3	
SETP 3113	Petroleum Economics	3	
SETP 3513	Petroleum Production Engineering*	3	
SETP 3123	Health, Safety and Environment*	3	
SETP 3323	Reservoir Simulation	3	SETP 3313#, SSCE 2393#
SETP 3812	Undergraduate Project I**	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**103**	

YEAR 3: SEMESTER 3 (SHORT SEMESTER)			
Code	**Course**	**Credit**	**Pre-requisite**
SETP 3915	Industrial Training	5	
	TOTAL CREDIT	5	
	CUMULATIVE CREDITS	108	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SETP 4814	Undergraduate Project II**	4	SETP 3812#
SETP 4822	Field Development Plan I**	2	SETP 4213, SETP 3213#, SETP 3313#, SETP 3413#, SETP 3513#
SETP 4213	Petroleum Geology	3	SETP 2213#
SETP 4113	Petroleum Management and Entrepreneurship	3	SETP 3113#,
SETP 4313	Well Testing	3	SETP 3313
	TOTAL CREDIT	**15**	
	CUMULATIVE CREDITS	**123**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SETP 4834	Field Development Plan II**	4	SETP 4822#
SETP 4323	Secondary and Tertiary Oil Recovery	3	SETP 3313#
SETP 4513	Gas Engineering	3	
SETP 4**3	Petroleum Eng. Elective	3	
SET* 4**3	Technical Elective	3	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**139**	

Note: * - cornerstone course; ** - capstone course;
- must pass (at least with grade D+) for prerequisite course

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

*Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

Petroleum Engineering Elective Courses

Code	Course	Credit	Pre-requisite
SETP 4123	Petroleum Refining Technology	3	
SETP 4223	Geophysics	3	
SETP 4413	Advanced Drilling Engineering	3	SETP 3413#
SETP 4423	Advanced Well Completion	3	SETP 3423#
SETP 4523	Well Diagnosis and Treatment	3	
SETP 4533	Production Data Analysis	3	

Technical Elective Courses

Code	Course	Credit	Pre-requisite
SETG 4143	Energy Management and Economics	3	
SETG 4163	Green Energy Technology	3	
SETG 4263	Fire and Explosion Safety	3	
SETG 4283	Corrosion Engineering	3	
SETN 4483	Radiographic Testing	3	
SETK 4333	Gas Transportation and Storage	3	
SETK 4223	Smart Materials	3	
SETK 4613	Fundamental of Polymer	3	
SETK 4623	Polymer Physics and Properties	3	
SETK 4633	Polymer Rheology and Processing	3	

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the courses are not allowed to graduate.

NO	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
PETROLEUM ENGINEERING COURSES					
1	SETP 1313	Introduction to Petroleum Engineering	3	3	
2	SETP 1113	Engineering Mechanics	3	3	
3	SETP 1123	Fluid Mechanics	3	3	
4	SETP 1133	Engineering Drawing	3	3	
5	SETP 1711	Fluid Mechanics Lab.	1	1	
6	SETP 2213	Basic Geosciences	3	3	
7	SETP 2721	Geosciences Lab	1	1	
8	SETP 2113	Thermodynamics	3	3	
9	SETP 2123	Mechanics of Materials	3	3	
10	SETP 2313	Reservoir Rock and Fluids Properties	3	3	
11	SETP 2731	Thermodynamics & Mechanics of Material Lab.	1	1	
12	SETP 3413	Drilling Engineering	3	3	
13	SETP 3741	Drilling Fluid Lab.	1	1	
14	SETP 3213	Formation Evaluation	3	3	
15	SETP 3313	Reservoir Engineering	3	3	
16	SETP 3731	Reservoir Engineering Lab.	1	1	
17	SETP 3921	Geology Field Work	1	1	
18	SETP 3423	Well Completion	3	3	
19	SETP 3113	Petroleum Economics	3	3	
20	SETP 3513	Petroleum Production Engineering	3	3	
21	SETP 3123	Health, Safety and Environment	3	3	
22	SETP 3323	Reservoir Simulation	3	3	
23	SETP 3812	Undergraduate Project I	2	2	
25	SETP 3915	Industrial Training (Year 3/Short Sem.) for 12 weeks/3 months	5	HL	
27	SETP 4814	Undergraduate Project II	4	4	
28	SETP 4822	Field Development Plan I	2	2	

29	SETP 4213	Petroleum Geology	3	3	
30	SETP 4113	Petroleum Management and Entrepreneurship	3	3	
31	SETP 4313	Well Testing	3	3	
32	SETP 4834	Field Development Plan II	4	4	
33	SETP 4323	Secondary and Tertiary Oil Recovery	3	3	
34	SETP 4513	Gas Engineering	3	3	
35	SETP 4**3	Petroleum Eng. Elective	3	3	
36	SET* 4**3	Technical Elective	3	3	
		TOTAL CREDIT OF PETROLEUM ENGINEERING COURSES (a)	92	87	
APPLIED SCIENCE / MATHEMATICS / COMPUTER COURSES					
1	SCSP 1103	Programming Technique I	3	3	
2	SSCE 1693	Engineering Mathematics I	3	3	
3	SSCE 1793	Differential Equations	3	3	
4	SSCE 1993	Engineering Mathematics II	3	3	
5	SSCE 2193	Engineering Statistics	3	3	
6	SSCE 2393	Numerical Methods	3	3	
7	SEEU 2003	Electrical Technology	3	3	
8	SSCK 1203	Analytical Chemistry for Engineering	3	3	
		TOTAL CREDIT OF APPLIED SCIENCE / MATHEMATICS / COMPUTER COURSES (b)	24	24	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHMS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			

2	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language Communication 2 (for International Students)			
Cluster 2: Generic Skills					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	U*** 2**2	University General Elective (Soft Skills Cluster)	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT 2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQF 2**2	Co-Curriculum & Service Learning	2	2	
2	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHL* 1112	Foreign Language Elective	2	2	
Cluster 6: Entrepreneurial Skills					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**23**	**23**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**139**	**134**	

OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC).

- **Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.**
- **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**

COMPULSORY PSC COURSES (Enroll All 3 Courses)		
1	GLRB0010	Design Thinking for Entrepreneur
2	GLRM0010	Talent and Competency Management
3	GLRL0010	English Communication Skills for Graduating Students (ECS)

ELECTIVE PSC COURSE (Choose 2 Only)		
1	GLRT0010	Data Analytics for Organization
2	GLRM0020	Professional Ethics and Integrity
3	GLRT0020	Construction Measurement (Mechanical & Electrical)
4	GLRT0030	OSHE for Engineering Industry and Laboratory
5	GLRT0040	OSHE for Construction Industry and Laboratory Works
6	GLRT0050	Quality Management for Build Environment and Engineering Professionals
7	GLRT0060	Safety and Health Officer Introductory Course
		More elective courses to be added in future

COURSE SYNOPSIS

CORE COURSES

SETP 1313 - Introduction to Petroleum Engineering

This course introduces students to various disciplines in petroleum engineering. The contents of the course include the origin, migration, accumulation and the exploration of petroleum, the types and properties of reservoir rocks and reservoir fluid, and type of formation evaluation. This course also briefly discusses the operation and equipment used in drilling, well completion and production of petroleum. This course is conducted by normal lectures, classroom discussion, group project and presentation.

SETP 1113 - Engineering Mechanics

This course has been designed to introduce students to the basic principles and concepts in statics and dynamics. The course is divided into two parts: the first part deals with the analysis of particle and rigid body in static, which covers the resultant and resolution of force(s) acting on a particle and rigid body, the equilibrium of a particle and rigid body, how to replace a force system with an equivalent system, and analysis of friction. The second part deals with the analysis of particle(s) in motion. It includes the kinematics and kinetics of particles and kinematics of rigid bodies. It will cover the rectilinear and curvilinear motion of particles, Newton's Second Law of particles and work and energy for particles.

SETP 1123 - Fluid Mechanics

This course introduces students to basic concepts and principles of fluid mechanics. The contents of the course include the physics of fluid, analysis of fluid in statics and in motion, friction in fluid flow, flow measurement, and dimensional analysis. This course is conducted by normal lectures, class exercise activities and group assignment.

SETP 1133 - Engineering Drawing

This course provides a fundamental background in engineering drawing to the students, which will enable them to work more effectively in the various fields of engineering. This course aims at developing the skills needed for documenting designs using drawings and for performing graphical analysis of two-dimensional and three-dimensional problems. The students will be exposed to different available CAD for engineering drawing with more emphasis on the utilization of QCAD and AutoCAD software. This course focuses on the introduction to engineering drawing, fundamentals of engineering drawing, geometry, orthographic and isometric drawing. This course also introduces the sectional and flowchart drawing and computer aided engineering drawing to the students.

SETP 1711 - Fluid Mechanics Laboratory

Co-Requisites: SETP 1123 Fluid Mechanics (Taken)

This course covers eight fluid mechanics-related experiments which are friction losses in pipe, stability of floating body, jet impact, flow measurement, water hammer, forced vortex flow, calibration of bourdon tube pressure gauge, and an open-ended laboratory work.

SETP 2213 - Basic Geoscience

This course introduces students with the introduction of geosciences/geology and subtitles of physical geology. The course emphasizes on the Earth physical & chemical characteristics, especially its surface and internal features. Then, turn to a discussion of Earth materials and the related processes. Next, Earth's internal structure and the processes that deform rocks and give rise to mountains will also be included. Finally, the course concludes with geologic time and Earth history.

SETP 2721 - Geoscience Laboratory

Co-Requisites: SETP 2213 Basic Geoscience (Taken)

This course exposes the student to the practical aspect of basic geosciences laboratory. It provides the students with the identification of minerals and rocks, geologic maps construction, particle size analysis of sediments and the use of Brunton compass in measuring strike and dip of geological structure planes.

SETP 2113 - Thermodynamics

Thermodynamics is a basic engineering course where concepts such as system, boundaries, mass, heat, work and energy are introduced. These concepts are then related in the 1st and 2nd Law of Thermodynamics. Properties of common fluid, such as water, air, and refrigerants are determined using tables of properties or equations of state. The concepts are applied in power and refrigeration cycles.

SETP 2123 - Mechanics of Materials

Pre-Requisites: SETP 1113 Engineering Mechanics (pass with at least D+)

The course covers both the theory and application of the fundamental principles of mechanics of materials. Emphasis is placed on the importance of satisfying equilibrium, compatibility of deformation, and material behavior requirement. Topics being covered include stress and strain under axial loading, torsion, bending, combined loadings, stress transformation, design of beams and shafts, and deflection of beams and shafts.

SETP 2313 - Reservoir Rock and Fluids Properties

This course introduces students to the important concepts, theories, and methods of properties determinations (calculation, correlation, and laboratory method) of some reservoir rock and fluid properties. The topics in reservoir rock properties include porosity, permeability, fluid saturation, rock compressibility, rock wettability, relative permeability, capillary pressure, and electrical properties of reservoir rocks. In reservoir fluid properties, the topics cover one- and two-phase behaviors of both ideal and real systems, gas properties, liquid properties, and reservoir fluid properties.

SETP 2731 - Thermodynamics and Mechanics of Material Lab.

Co-Requisites: SETP 2113 Thermodynamics, SETP 2123 Mechanics of Materials (Taken)

This laboratory course contains 6 experiments that cover basic concepts in Thermodynamics and Strength of Materials. Laboratory experiments are designed for hands-on experiences to understand the engineering principles. The experiments application includes First and Second Law of Thermodynamics, Properties of Pure Substances and Properties & Strength of

Materials. This course also emphasizes the technical writing aspect where all students' observation and arguments of each experiment must be reported in proper format.

SETP 3413 - Drilling Engineering

This course introduces the activities involved in drilling operations. The contents of the course include the rig components and drilling systems, types of drilling fluid and properties, drilling fluid formulations and calculations, drilling problems, drilling hydraulics calculation, formation pressures and its effect to the drilling operations, well control and well configurations. This course is conducted through lectures, group assignments, and presentations.

SETP 3741 - Drilling Fluid Laboratory

Co-Requisites: SETP 3413 Drilling Engineering (Taken)

This course requires the students to perform hands-on preparing and measuring drilling fluids properties according to the API standard. Laboratory experiments are designed to help students in better understanding of the factors controlling drilling fluid properties as well as familiarize students with field testing procedures of drilling fluids. This laboratory is equipped with complete drilling fluid testing and analysis. Equipment available include mud mixers, mud balances, marsh balances, rheometers, pH meters, resistivity meters, and the filter press unit, etc.

SETP 3213 - Formation Evaluation

This course exposes students to electric logging which covers the basic concept of reservoir resistivity, spontaneous potential, resistivity log, Gamma-ray log, neutron log, formation density log, and acoustic log. Lectures also cover on the open hole log analysis and interpretation, the use of Archie's equation and other methods to determine water saturation, lithology and porosity determination, and assessing the true formation resistivity prior to computing the hydrocarbon reserves.

SETP 3313 - Reservoir Engineering

Pre-requisites: SETP 2313 Reservoir Rock and Fluids Properties (pass with at least D+)

This course covers the fundamentals of reservoir engineering which include the description and characterization of the oil and gas reservoirs, calculation of fluid in-place and the recoverable reserves, theory and calculation of fluid flow in porous media, and the influence of aquifer on reservoir performance. This course is conducted by normal lectures and student group projects based on published reservoir data.

SETP 3731 - Reservoir Engineering Laboratory

Co-Requisites: SETP 3313 Reservoir Engineering (Taken)

The content of this laboratory works can assist students to understand better the theories they learned from the Reservoir Rock and Fluid Properties course. Measurement of absolute permeability: gas permeameter and liquid permeameter. Measurement of viscosity: glass capillary, Brookfield apparatus and Kern balance. Measurement of porosity: helium porosimeter and Ruska pump apparatus. Measurement of relative permeability: core lab retorted. Measurement of density: gas density, hydrometer. Measurement of capillary pressure.

SETP 3921 - Geology Field Work

Pre-requisites: SETP 2213 Basic Geoscience (pass with at least D+)

This course exposes the students to the practical aspect of geological field and geology of Malaysia. Students will be trained on how to make geological observations including simple geological mapping using the compass-step method.

SETP 3423 - Well Completion

The course covers casing design, cementing job, well completion practices, and completion and workover fluids in order to maintain well integrity. Lectures also cover types of perforations, tubing string and its accessories, production packer and tubing sealing assemblies that should be installed in production wells to produce oil and gas safely to the surface.

SETP 3113 - Petroleum Economics

This course introduces students to petroleum economics in evaluation of oil and gas development and production. The contents of the course include the principles, methods, and techniques of engineering economic analysis, such as topics on interest and time value of money, depreciation and income tax calculations, cash flow, economic indicators, decision making, and risk and sensitivity analysis. This course will allow students to finally be able to generate cash flow of the project and perform an economic evaluation of the project.

SETP 3513 - Petroleum Production Engineering

This course introduces students to a complete petroleum production system of a petroleum well/field. The course will provide an overview of the well/field petroleum production system components including production philosophy and objectives, present and future well productivity and performance, single and multiphase flow system for surface delivery, artificial lift system and surface facilities. By the end of the course, students should be able to identify and describe the major components of the petroleum production system, understand the mechanism of delivering the reservoir fluid to the surface and the process involved for optimum production of petroleum sellable products.This course is conducted by normal lectures, classroom work and group project report and presentation with software utilization in the classroom and group project work.

SETP 3123 - Health, Safety and Environment

The course presents a fundamental principle of safety and risk assessment in petroleum engineering. In particular, it emphasizes on the safety legislations, inherent safety design concept, methods of hazard identification, chemical health risk assessment and various methods of risk assessments. The course also covers health and environmental issues related to petroleum engineering. At the end of this course, it is expected that the students will be able to appreciate the theoretical and practical aspects of occupational safety, health and environment in petroleum engineering. Students should also be able to use the techniques of hazard identification and risk assessment in the design and operation of petroleum engineering projects.

SETP 3323 - Reservoir Simulation

Pre-Requisites: SETP 3313 Reservoir Engineering, SSCE 2393 Numerical Methods (pass with at least D+)

This course includes derivations of basic equations and underlying principles used in developing reservoir simulators. It covers the development of a simple governing equation, partial differential equations for single-phase and multiphase flow in porous media. Finite difference approximations are used to solve the equations. Input data requirements and applications of simulation models for history matching and prediction of field performance will be discussed. A spreadsheet, i.e. Microsoft Excel, would be used for many of the examples and exercises.

SETP 3812 - Undergraduate Project 1

This course is designed to train students on some important aspects of research management. In the first part of the undergraduate research project course, the students are not only required to carry out preliminary studies on the assigned petroleum engineering related topics but are also required to plan the research methodology that will be implemented in the following semester and maintain a log book. At the end of this course, students are required to prepare a complete research proposal, and subsequently present it. In addition, students will have the opportunity to gain important generic skills such as communication, team working, problem-solving and creative and critical thinking.

SETP 3915 - Industrial Training

A 12-week training in industry. The main rationale of introducing the programme is to provide UTM students with exposure to practical aspects of industry and their work practices. During the programme, the students will have the opportunity to relate their theoretical understanding to the real application in industry and to develop skills in work ethics, management, communication and human relations.

SETP 4814 - Undergraduate Project II

Pre-Requisites: SETP 3812 Undergraduate Project I (pass with at least D+)

This course is a continuation of the Undergraduate Project I. The second part of the Undergraduate Project requires students to implement the research proposal that has been prepared in the previous semester. This might involve practical activities such as laboratory works, data collection from industry and computer programming/simulation. At the end of the course, students should be able to prepare a full report compiling the first and second part of the Undergraduate Research Project and subsequently present their research findings. Finally, students must submit a bound thesis according to the UTM thesis-writing format. In addition, at the end of the course, students will have the opportunity to gain important generic skills such as communication, team working, problem-solving and creative and critical thinking.

SETP 4822 - Field Development Plan I

Pre-Requisites: SETP 3213 Formation Evaluation, SETP 3313 Reservoir Engineering, SETP 3413 Drilling Engineering, SETP 3513 Petroleum Production Engineering (pass with at least D+)

Co-Requisites: SETP 4213 Petroleum Geology (Taken)

Field Development Plan courses expose students to the process and methods in developing an optimum plan for a particular petroleum field. It covers all aspects of field development planning, commencing with screening studies, after discovering hydrocarbons, to project sanction. The first part of the course covers collection and analysis of data, including proving of resources and reduction of uncertainty and risk. Students must build a model of geological layering of the subsurface to estimate the initial volume of oil and gas in the reservoir.

SETP 4213 - Petroleum Geology

Pre-Requisites: SETP 2213 Basic Geoscience (pass with at least D+)

This course exposes the students with the introduction of petroleum geology, sedimentology and applied geophysics to the search for and production of oil and gas. Explanation will be given on the source rocks, kerogen, the concept of maturity of organic matter, and the process of generation of petroleum. The topics on sedimentology and stratigraphy will also be included, to give the knowledge of reservoir rock characteristics and identifying areas of petroleum accumulation. The processes of migration, entrapment of petroleum, types of sedimentary basins and petroleum system will also be discussed to give an idea of the locations and distribution of oil and gas fields around the world as well as its relationship to the zone of seismicity.

SETP 4113 - Petroleum Management and Entrepreneurship

Pre-Requisites: SETP 3113 Petroleum Economics (pass with at least D+)

This course is pertinent to petroleum engineering and business topics. It will cover the types of PSC normally practised in Malaysia. A group project, utilizing a widely used industry software package for economic evaluations will be given. The project consisted of information regarding possible investments in oil and/or gas fields to determine the best options of development for the fields that would yield the maximum total return on investment. The knowledge of financing, costing, and budgeting will be considered in the analysis.

SETP 4313 - Well Testing

Pre-Requisites: SETP 3313 Reservoir Engineering (pass with at least D+)

This course introduces students to well testing practices in oil and gas industries. The contents of the course include the concept and principles of well testing, equipment, well test interpretation methods and well test design. This course is conducted by normal lectures, class workshop, and application software activities.

SETP 4834 - Field Development Plan II

Pre-Requisites: SETP 4822 Field Development Plan I (pass with at least D+)

The objective of this course is to provide training, assignment and understanding of a particular development plan and profitability analysis on a particular gas or oil fields or both which are found either onshore or offshore. The second part of the course covers the simulation of the reservoir fluid flow behavior and optimises the field development scenario. This simulation

leads to the design of an appropriate production system. An economic assessment is performed taking into account revenue according to production forecasts and the estimated development costs. Students are required to work in small groups, submit written plans, and present their proposals to a panel.

SETP 4323 - Secondary and Tertiary Oil Recovery

Pre-Requisites: SETP 3313 Reservoir Engineering (pass with at least D+)

This course provides students with important concepts, theories, and methods of enhanced oil recovery (EOR). This course covers the general classification of EOR processes, microscopic displacement of multiphase fluids in porous media, the concept of mobilization and trapping of oil, mobility ratio, capillary number, gravity segregation, and recovery efficiencies. Also included are the important concepts and operational procedures of various types of EOR methods such as polymer flooding, surfactant/micellar flooding, alkaline flooding, ASP flooding, miscible gas flooding, thermal recovery processes and microbial EOR.

SETP 4513 - Gas Engineering

The course introduces students to connect the relationship between upstream and downstream gas processing which covers both theories and calculations. The contents of the course include the gas well deliverability, gas well performance, gas pipeline flow, gas compressors, gas dehydration, gas treatment, and gas measurement. This course is conducted through lectures, group assignments, and presentations.

PETROLEUM ENGINEERING ELECTIVE COURSES

SETP 4123 - Petroleum Refining Technology

This course introduces the characteristics of crude oil and that each of the hydrocarbon compounds has its own boiling temperature. The principles of distillation are introduced leading to the separation into fractions according to cut points. Maximisations of cuts or fractions are achieved through processes like catalytic cracking, alkylation, catalytic reforming and hydro cracking. Gasoline blending is introduced to increase octane number for better performance and to provide designed vapour pressure in gasoline to cope with seasonal altitudinal needs.

SETP 4223 - Geophysics

This course introduces students with the introduction and application of exploration geophysics in resource exploration and development, and pollution control. The course emphasis on the methods of geophysical techniques, especially seismic methods, including some of the modern interpretation techniques. It will discuss the general approach, equipment and field operations of the methods used. The course will also provide practice in carrying out a small-scale fieldwork project to investigate shallow geological features which are presumed to exist in the subsurface.

SETP 4413 - Advanced Drilling Engineering

Pre-Requisites: SETP3413 Drilling Engineering (pass with at least D+)

This course introduces students to special operations such as coring and fishing, advanced drilling operations and techniques used in the industry, drilling optimization and, procedures and legislation of well abandonment.

SETP 4423 - Advanced Well Completion

Pre-Requisites: SETP3423 Well Completion (pass with at least D+)

Upon completion of this course, students should be able to prepare well space-out for single and dual completions. This course also exposes students to a safe slickline and completion operations, and preparation of a completion report after the respective well has been released to production and slickline report upon completion of its operation. The content delivered also covers deepwater completion and slickline operations, and completion in unconventional hydrocarbon energy sources.

SETP 4523 - Well Diagnosis & Treatment

Pre-Requisites: SKTP3413 Drilling Engineering (pass with at least D+)

The course covers problem wells, diagnosis of problem wells, through tubing production tubing, formation damage, work over planning, sand control, and
stimulation.

SETP 4533 - Production Data Analysis

This course introduces students how to analyze the data from oil and gas production hystory. The contents of the course include the methods of how to analyze rate-time production data to estimate reserves, to analyze pressure-rate-time production data to obtain reservoir volume, and to make performance forecasts for well reservoir systems. This course is conducted by normal lectures, class workshop, and application software activities.

TECHNICAL ELECTIVE COURSES

SETG 4143 - Energy Management and Economics

This course introduces basic background, terminology, and fundamentals of energy conversion. Discusses current and emerging technologies for production of thermal, mechanical, and electrical energy. Topics include fossil and nuclear fuels, solar energy, wind energy, fuel cells, and energy storage.

SETG 4163 - Green Energy Technology

The aim of the programme is to prepare students for a professional career in the development of advanced technologies and systems that can satisfy energy demand while striving for environmental, social and economic sustainability. In addition to in-depth knowledge of energy technologies and systems, students will be trained to understand the basic challenges of sustainable development, with a specific focus on the challenges that face the energy system. The course is unique in that it deals with the energy system on all relevant systems levels and that the courses are integrated in such a way that students are trained to approach problem solving in an interdisciplinary way. At the end of the course, students will have acquired a thorough insight into the possibilities and limitations of energy systems, specifically in relation to sustainable development.

SETG 4263 - Fire and Explosion Safety

This course enables students to understand the basic concept of fire science and combustion and related calculations as well as to expose them to the concept of explosion and detonation. In addition, the principles of fire and explosion protection and mitigation will be discussed within the context of understanding the fire and explosion development mechanism. At the end of the course, students should be able to explain and relate the fundamental knowledge of combustion, flame and explosion and its important safety aspects involving gaseous fuel utilization. Students should able to apply general combustion and engineering principles to fires and explosion and should know the parameters involved on the initiation of both fire and explosion. The students should be also able to use CFD fire modeling (CFast) to analyze the fire development on the case studies given.

SETG 4283 - Corrosion Engineering

The aim of this course is to provide basic knowledge of corrosion and corrosion protection of metals and alloys from electrochemistry perspective. This course is specially designed for students who want to have a basic understanding of the corrosion process. Students will be introduced to the underlying science of corrosion engineering principles, corrosion management with particular emphasis on the corrosion design of pipeline corrosion protection. Different types of corrosion, methods of corrosion protection and prevention standard corrosion tests will be discussed. This course also covers most traditional and non-traditional tests for corrosion studies, including electrochemical techniques for corrosion, analysis of corrosion phenomenon and corrosion monitoring principles. This course will examine the general mechanisms of corrosion and relate these to specific engineering issues and methods being used to reduce the cost of corrosion. Finally at the end of the course student will be required to do a case study on corrosion problem that shall introduces students on real corrosion problem in industries and group project allow students to become familiar with directing their own investigations of corrosion problem.

SETN 4483 - Radiographic Testing

This course describes Non-Destructive Testing (NDT) which is the process of inspecting, testing or evaluating materials, components or assemblies for discontinuities without destroying their serviceability. The course introduces the six most common NDT methods which are Visual Testing, Liquid Penetrant Testing, Magnetic Particle Testing, Radiographic Testing, Ultrasonic Testing and Eddy Current Testing. Emphasis will be given to Radiographic Testing which is also known as Industrial Radiography. Metal forming and manufacturing processes and possible defects present in each process will be described. The most widely used industry inspection and acceptance standards for NDT such as ASME V, VIII and API 1104 will be described.

SETK 4333 - Gas Transportation and Storage

This course enables students to develop an advanced knowledge in gas transportation and storage facilities. The course module covers a wide range of scope which includes the flow principles, operation and construction and maintenance. Sustainability of supply and storage system is well reviewed to incorporate state-of-the-art technology. The module also integrates the standards design of transportation system and relevant code of practices. Malaysian standard requirements also are highlighted thoroughly.

SETK 4223 - Smart Materials
This course will provide deeper understanding of smart materials and smart microstructures, as well as of the increased functionality of both inorganic and organic materials. This course also covers on the material synthesis as well as microstructure and properties relationships.

SETK 4613 - Fundamentals of Polymer
Basic terminologies, principles on polymers and structural relationship towards polymer classification are discussed. An overview on the polymer industry is elaborated together with its impact on human life. Molecular weight relationships toward polymer properties and its implication are briefly presented. This course emphasises specifically on the advanced of polymer synthesis including step-growth, chain-growth and co-ordination polymerizations. Kinetic for the polymerization mechanism is described and its relationship to molecular weight is explained in details. The limitations and application for each polymerization mechanism are discussed. The polymerization systems used for the polymerization process are discussed together with their advantages and the disadvantages. Finally, this course also exposed students to the pilot scale set-up of the polymerization systems.

SETK 4623 - Polymer Physics and Properties
This course is designed to expose students to the properties of polymer which have great importance. It will emphasize on the mechanical properties, electrical properties, chemical resistance, degradation effects and flammability properties, A strong emphasis will be given on the mechanical properties which include viscoelastic behavior, tensile, flexural and impact properties. Long term test using creep deformation is also included. At the end of the course the student should be able to explain the interrelation between polymer properties, structures and applications. The students should also be able to describe the appropriate test and characterization for each property.

SETK 4633 - Polymer Rheology and Processing
This course will discuss about Newtonian and non-Newtonian flow, pseudo-plastic, Bingham, dilatant and thixotropic behavior, origin of non-Newtonian flow. Students will be able to do Modelling of polymer melt flow-isothermal flow of Newtonian and power law fluids (drag and pressure flow) through different channels of uniform cross-section. This course will also cover topic such as measurement of flow properties, melt flow indexer, capillary viscometers, and cone and plate viscometer, characteristics and Rabinowitch correction. Students should be able to explain the application of rheological studies in polymer processing-extruder screw and die, analysis of pressure, drag and leakage flow, characterization and interaction of screw and die, balanced runner molding.

INTEGRATED BACHELOR - MASTER PROGRAMME (PRISMS) ELECTIVE COURSES

LIST of PRISMS ELECTIVE COURSES

1. **Master of Science (Energy Management)**

- SKTK 5113 / SETK 5113 - Energy Life Cycle Cost and Emission Analysis
- SKTK 5123 / SETK 5123 - Energy Planning for Sustainable Development
- SKTK 5133 / SETK 5133 - Mechanical and Electrical Energy Management

2. **Master of Science (Safety, Health and Environment)**

- SKTK 5213 / SETK 5213 - Occupational Safety

3. **Master of Science in Polymer Technology**

- SKTK 5613 / SETK 5613 - Polymer Characterization
- SKTK 5623 / SETK 5623 - Polymer Synthesis
- SKTK 5633 / SETK 5633 - Polymer Additives, Blends and Rheology
- SKTK 5643 / SETK 5643 - Polymer Processing

4. **Master of Engineering in Chemical**

- SKTK 5513 / SETK 5513 - Advanced Thermodynamics
- SKTK 5523 / SETK 5523 - Numerical Computation in Chemical Engineering
- SKTK 5533 / SETK 5533 - Advanced Chemical Reaction Engineering

5. **Master of Engineering in Bioprocess**

- SETB 5103 - Biotechnology for Engineers
- SETB 5113 - Industrial Bio-processing
- SETB 5123 - Facilities and Infrastructure in Bioprocess Engineering
- SETB 5133 - Advanced Bio-product Development

6. **Master of Gas Engineering and Management**

- SETG 5123 - Hydrocarbon Gas Transportation and Storage
- SETG 5223 - Asset Management and Control
- SETG 5233 - Hydrocarbon Gas Contract Negotiation and Implementation
- SETG 5243 - Hydrocarbon Gas Project Planning, Development and Financing

PRISMS ELECTIVE COURSE SYNOPSIS

1. Master of Science (Energy Management)

SKTK 5113/SETK 5113 - Energy Life Cycle Cost and Emission Analysis

This course discusses life cycle cost analysis for energy conservation projects and emission analysis through the life cycle of a product. It presents the principles, methodology and case studies to develop an understanding of life cycle cost and emission analysis that can reduce environmental impact and promote sustainable practice.

SKKC 5123 / SKTK 5123 - Energy Planning for Sustainable Development
This course provides students with the ability to use computer aided tools for sustainable energy planning. Emphasis will be placed on the formulation of mathematical models, solve and interpret meaningful problems in energy related issues. The student will be exposed on the formulation of various energy issues including micro and macro level.

SKKC 5133 / SKTK 5133 - Mechanical and Electrical Energy Management
This course introduced the students on techniques to conduct mechanical and electrical energy audits for buildings. This course presents 3 parts of lecture, Part A is the introduction to general energy audit. Part B will cover energy audit on mechanical equipment such as electric motor, chiller, cooling tower, fans & blower, pumps, air compressor energy audit and Part C is the electrical systems energy audit that covers electrical systems.

2. Master of Science (Safety, Health and Environment)

SKKC 5213 / SKTK 5213 - Occupational Safety
Occupational safety is an area concerned with the safety, health and well-being of people engaged in work or employment. It is a two-way relationship between work environment and safety. Occupational safety is a part of the safety science curriculum. Compared to process safety, occupational safety concerns more on the workers welfare merely due to day-to-day work activities than the impacts on lives, assets and environment due to abnormal process operation. This course introduces concepts of occupational safety with primary focus on various types of occupational hazards in a typical workplace environment. For each type of hazard, students are provided with detailed discussion, ranging from understanding the hazard to the factors that may cause the accidents in the workplace. Also the types of injuries that may be caused by the hazards are also discussed before appropriate recommendations and strategies to avoid or reduce the hazards are presented. Overall, through this course, students will acquire the knowledge and judgment to function as an entry-level practitioner in occupational safety and health. Students also should be able to contribute to the development and maintenance of a safe and healthy work environment.

3. Master of Science in Polymer Technology

SKKC 5613 / SKTK 5613 - Polymer Characterization
This course introduces students with comprehensive knowledge of the various techniques available to characterize polymeric materials, the underlying principles of each characterization method, the use and the limitations of each technique. This course will focus mainly on four approaches of characterization, which are characterization of polymers in solution, spectroscopy, thermal analysis and microscopy. In characterization of polymers in solution, it will cover measurements of molecular weight and molecular weight distribution. In spectroscopy students will learn classification of spectroscopic methods and different types of spectroscopy instruments. In thermal analysis students will learn various techniques of thermal analysis such as differential scanning calorimeter (DSC), thermal gravimetric analysis (TGA), and dynamic mechanical analysis (DMA). The microscopy topic will cover various techniques of microscopy analysis such as optical microscopy, scanning electron microscopy (SEM), transmission electron microscopy (TEM) and atomic force microscopy (AFM).

SKKC 5623 / SKTK 5623 - Polymer Synthesis

Basic terminologies, principles on polymers and structural relationship towards polymer classification are discussed. An overview on the polymer industry is elaborated together with its impact on human life. Molecular weight relationships toward polymer properties and its implication are briefly presented. This course emphasizes specifically on the advance of polymer synthesis including step-growth, chain-growth and coordination polymerizations. Kinetic for the polymerization mechanism is described and its relationship to molecular weight is explained in detail. The limitations and application for each polymerization mechanism are discussed. The polymerization systems used for the polymerization process are discussed together with their advantages and the disadvantages. Finally, this course also exposed students to the pilot scale set-up of the polymerization systems.

SKTK 5633 / SETK 5633 - Polymer Additives, Blends and Rheology

This course consists of three parts: (a) polymer Additives (b) blending (c) rheology. Polymer additives cover the topics on heat and light stabilisers, impact modifiers, antioxidants, lubricants, plasticisers, flame retardants and colourants. The theory and mechanism of each additive will be explained. In polymer blending the methods of blending, compatibilizing mechanism and current development in polymer blends will be explained. Whilst polymer rheology elaborates the behaviour of polymer flow in a pipe as well as between plates. Polymer rheology covers a flow and deformation of polymer melts, understanding regarding the effect of shear on flow properties will be discussed in detail. Experimental method and equipment will provide an understanding of rheological properties of polymer melts. Data obtained from rheological experiments will be corrected by using several methods and models. Finally, final properties of polymer melts will be analysed and step by step methods will be explored to solve any defects and problems.

SKTK 5643 / SETK 5643 - Polymer Processing

This course introduces students on processing of thermoplastic and composite materials in general. Details fundamental of polymer processing such as extrusion and injection moulding will be emphasized. Elements of product design will also be covered in this course. The course will further discuss and explain the preparation and manufacture of fibre reinforced polymer composite. At the end of the course, students should be able to assess manufacturing processes to produce variation of polymer composite products.

4. Master of Engineering in Chemical

SKTK 5513 / SETK 5513 - Advanced Thermodynamics

This course presents the fundamentals of thermodynamics theories in equilibrium systems. Selected equation of states as well as several equilibrium models will be utilised in predicting the chemical properties of chemical components at equilibrium with and without chemical reactions. The course features extensive work group exercises as well as individual projects and assignments.

SKTK 5523 / SETK 5523 - Numerical Computation in Chemical Engineering

The main objective of this course is to provide the students with the opportunity to improve their programming skills using the MATLAB environment as a tool for solving problems in chemical engineering. This course includes the coverage of basics and application of MATLAB software to solve problems arising in chemical engineering which involve numerical operations like root of equations, curve fitting and ordinary differential equations problem. With this foundation of basic MATLAB applications in engineering problem solving, the course provides opportunities to explore advanced topics in application of MATLAB as a powerful engineering tool.

SKKC 5533 / SKTK 5533 - Advanced Chemical Reaction Engineering

This course introduces students to chemical reactor design and theories in the area of chemical reaction engineering with emphasis on homogeneous and heterogeneous reactions. It will examine problems related to multiple reactions and non-isothermal operations. Students will also work cooperatively on computer assignments to expose them to solving problems using software packages such as PolyMath.

5. Master of Engineering in Bioprocess

SETB 5103 - Biotechnology for Engineers

This course covers basic understanding of microorganisms and genetic engineering involved in biotechnology. First, biotechnology definition and timeline is presented. The concept of protein expression, different expression systems used in biotechnology and the omics technology are also covered. The course is aimed at providing the fundamentals of biotechnology and knowledge on how biotechnology evolves from the ancient time. This course also consists of 6 modules and 1 fieldwork. The first 3 modules cover biotechnology application in different areas i.e. food, agriculture, medical, and environment. Next, 2 modules on the global scenario of biotechnology industry and biotechnology in Malaysia and current issues are discussed. It also discusses how this technology contributes towards wealth creation, health improvement, environmental protection and issues related to social security globally. The active involvement of Malaysia in biotechnology for a new source of economic engine is also discussed and evaluated. The last module deals with bioethics issues in biotechnology.

SETB 5113 - Industrial Bio-processing

This course introduces students to the fundamentals of various industrial bioprocessing areas based on the sources and applications. Emphasis will be on the technologies in which the students will be guided in being independently acquired and explain information on some key issues in food and bioproducts engineering, biopharmaceutical engineering, renewable resources and waste management bioprocessing science and technology.

SETB 5123 - Facilities and Infrastructure in Bioprocess Engineering

This course provides a complete overview about the production facility from the beginning of the project up to the production process and how to perform all project steps according to the guidelines of the Good Manufacturing Practice (cGMP). Topics will include: the primary and detailed engineering in the production area, flow inside the facility (personnel, material,

product and waste flow), the design of the HVAC system and clean area according to the cGMP requirements. Besides the engineering and design aspects, the course also encompasses all aspects of the cGMP requirements for the production equipment, from cell bank to the final product. Furthermore non-design/equipment components of the cGMP such as, human resource, process design and operation procedure based on Standard Operation Procedures (SOPs) sheet is also introduced.

SETB 5133 - Advanced Bio-product Development
This course introduces students to the advance of bio-product development based on the sources and functional applications. Emphasis will be on the technologies in the development of bio-products; various types of materials/bio-materials, design, operations and analysis of their desired performances. The course also exposes students to the different stages in the development of a bio-product, from the research and development to manufacturing, bio-product approval and release of the final product.

6. Master of Gas Engineering and Management

SETG 5123 - Hydrocarbon Gas Transportation and Storage
This subject enables students to acquire and practice the fundamental knowledge of liquefied petroleum gases (LPG), and natural gases (NG) transportation and storage. The students are also required to prepare a group technical report and present their project at the end of the course. Students will also utilise computer software in executing their project.

SETG 5223 - Asset Management and Control
The Asset Management and Control course is dealing with the study of systems/methods/approaches/techniques that monitors and maintains things of value to an entity of a group/organization/company. It may apply to both tangible assets and to intangible concepts. Throughout the course, strong emphasis is placed on how the practice of managing assets to achieve the greatest return (particularly useful for productive assets such as plant and equipment) and the process of monitoring and maintaining facilities systems with the objective of providing the best possible service to users.

SETG 5233 - Hydrocarbon Gas Contract Negotiation and Implementation
This course enables students to understand the concept of hydrocarbon gas negotiation to sustain the stable supply of energy since consumers are interested in long term stability, predict the potential policy mistake, gas development risks, strategy for the gas chain and relationship between gas supply and purchase agreement, prepare the draft invoice for gas supply and purchase agreement, legal framework, contract structure, and explain the role of government with regard to the energy supply.

SETG 5243 - Hydrocarbon Gas Project Planning, Development and Financing
This course enables students to elaborate confidently on government policy and regulatory framework related to oil and gas industry, set out the principles of planning on development of gas projects, become leader in safe and efficient operation in the oil, gas and petrochemical industry in Malaysia, and prepare an analysis on investment and financing of gas potential projects.

SCHOOL OF CIVIL ENGINEERING

MANAGEMENT TEAM

Chair
Prof. Dr. Norhazilan Bin Md. Noor

Associate Chair (Research & Academic Staff) Prof. Dr. Khalida Muda

Acting Associate Chair (Quality & Strategy) Dr. Mohd Hafiz Puteh

Acting Associate Chair (Continuing & Transnational Education) Assoc. Prof. Ir. Ts. Dr. Mohamad Hidayat Jamal

Associate Chair (Academic & Student's Development) Assoc. Prof. Dr. Suhaimi Abu Bakar

Associate Chair (Facility) Assoc. Prof. Dr. Ahmad Safuan A. Rashid

Director (Structure & Materials) Assoc. Prof. Dr. Norhisham Bakhary

Director (Geotechnics & Transportation) Dr. Nor Zurairahetty Mohd Yunus

Director (Water & Environmental Engineering) Dr. Shamila Azman

Academic Manager
Dr. Mohd Hafiz Puteh

Position	Name
Chair	Professor. Dr. Norhazilan Bin Md Noor norhazilan@utm.my 07-553 1500
Associate Chair (Academic and Student Development)	Associate Professor Dr. Suhaimi Abu Bakar/Md Ramli suhaimibakar@utm.my 07-553 1507
Associate Chair (Research and Academic Staff)	Professor Dr. Khalida Muda khalida@utm.my 07-553 1503
Acting Associate Chair (Quality and Strategy)	Dr. Mohd Hafiz Puteh mhafizputeh@utm.my 07-553 1744
Acting Associate Chair (Continuous Education and TNE)	Associate Professor Ir. Ts. Dr. Mohamad Hidayat Jamal mhidayat@utm.my 07-553 2536
Associate Chair (Facility)	Associate Professor Dr. Ahmad Safuan A. Rashid ahmadsafuan@utm.my 07-553 1591
Director (Structures and Materials)	Associate Prof. Dr. Norhisham Bakhary norhisham@utm.my 07-553 1504
Director (Water and Environmental Engineering)	Dr. Shamila Azman shamila@utm.my 07-553 1506
Director (Geotechnics and Transportation)	Ts. Dr. Norzurairahetty Mohd Yunos nzurairahetty@utm.my 07-553 1587
Academic Manager	Dr. Mohd Hafiz Puteh mhafizputeh@utm.my 07-553 1744

BACHELOR OF CIVIL ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Civil Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on coursework's and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor in Civil Engineering	
4. Final Award			Bachelor of Civil Engineering with Honours	
5. Programme Code			SEAWH	
6. Professional or Statutory Body of Accreditation			Kementerian Pendidikan Malaysia	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study (Conventional, distance learning, etc)			Conventional	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum : 4 yrs Maximum : 6 yrs	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	14	-
Short	4	-	8	-

Course Classification

No	Classification	Credit Hours	Percentage
i.	University Courses a. General b. Language c. Entrepreneurship d. Co-Curriculum e. Mathematics	 8 8 2 3 15	26.3%
ii.	Faculty/Programme Core	92	67.2%
iii.	Programme Electives	9	6.6%
	Total	**137**	**100%**
A	Engineering Courses (a) Lecture/Project/Laboratory (b) Workshop/Field/Design Studio (c) Industrial Training (d) Final Year Project	 79 6 5 6	70.1%
Total Credit Hours for Part A		**96**	
B	Related Courses (a) Applied Science/Mathematic/ Computer (b) Management/Law/ Humanities/Ethics/Economy (c) Language (d) Co-Curriculum	 20 10 8 3	29.9%
Total Credit Hours for Part B		**41**	
Total Credit Hours for Part A and B		**137**	100%
Total Credit Hours to Graduate		**137 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 139 credit hours with a minimum CGPA of 2.0.
- Pass Industrial Training
- Complete all Professional Skills Certificate (PSC)
- Students from other approved programmes who wish to undertake a Minor in the programme must complete not less than 15 credit hours of specialized Civil Engineering courses which from part of the core and/or electives of the programme, as listed in the minor programme list.

Entry Requirements

The minimum qualifications for candidates who intend to do a Bachelor of Engineering (Civil) are as follows:

1) Minimum results based on **the Malaysian High School Certificate (STPM)** (results would be based on the general requirements as well as other conditions as the pre-requisites for the programme set by the university).

General University Requirements:

i. Passed and obtained good results in the **Malaysian Certificate Examination (SPM)** or its equivalent.
ii. Passed Bahasa Melayu /Bahasa Malaysia with **credit** in the SPM/equivalent.
iii. Passed the **Malaysian High School Certificate (STPM)** or its equivalent and obtained the following:
   a) **Grade C (NGMP 2.00)** General paper, and
   b) **Grade C (NGMP 2.00)** in two (2) other subjects
iv. Passed the Malaysian University English Test (MUET) with minimum result of **Band 1**.

Special Requirements for the Programme

i. Obtained a **CGPA of 2.80**; and Passed with a minimum **Grade B- (NGMP 2.67)** in two of the following subjects:
   a) Mathematics T / Further Mathematics
   b) Physics/ Chemistry/ Biology
   (Eligible candidates in **Physics** subjects at Matriculation / Foundation must obtained minimum of **Grade C** in SPM for **Chemistry** subjects.) Or
   (Eligible candidates in **Chemistry or Biology** subjects at Matriculation / Foundation must obtained minimum of **Grade C** in SPM for **Physics** subjects.)
ii. Passed **Mathematics** and **Physics** in SPM with minimum of **GRED C.**
iii. Passed the **Malaysian University English Test (MUET)** with minimum result of **Band 2**.
iv. No disabilities which inhibit physical activities.

2) Minimum requirements for **Matriculation Certificates (KPM) / Asasi Sains UM / Asasi UiTM** (fulfil the general requirements set by the university as well as other conditions of the programme).

General University Requirements

i. Passed the **Malaysian Certificate Examination (SPM)** / equivalent examination with **GRED C** in Bahasa Melayu/Bahasa Malaysia.
ii. Passed the **Matriculation Certificate Examination KPM/Asasi Sains UM / Asasi UiTM** with a minimum **CGPA of 2.00** and passed all the core subjects.

iii. Passed the **Malaysian University English Test (MUET)** with minimum result of **Band 1**.

Special Requirements of the Programme:

i. Obtained a **CGPA of 2.80**; and Passed with a **Grade B- (CGPA 2.67)** in two of the following subjects:
   a) Mathematics
   b) Physics/ Engineering Physics / Chemistry / Engineering Chemistry / Biology
   (Eligible candidates in **Physics / Engineering Physics** subjects at Matriculation / Foundation must obtained minimum of **Grade C** in SPM for **Chemistry** subjects.)
   Or
   (Eligible candidates in **Chemistry / Engineering Chemistry or Biology** subjects at Matriculation / Foundation must obtained minimum of **Grade C** in SPM for **Physics** subjects.)

ii. Passed **Mathematics** and **Physics** in SPM with minimum of **GRED C.**

iii. Passed the Malaysian University English Test (MUET) with minimum result of **Band 2**.

iv. No disabilities which inhibit physical activities.

3) Minimum qualifications for students with **Certificates/Diplomas**
(Fulfill the general requirements set by the university as well as specific requirements of the programme).

General University Requirements

i. Passed the **Malaysian Certificate Examination (SPM)** / equivalent examination with **credit** in Bahasa Melayu/Bahasa Malaysia.

ii. Obtained a **Diploma** or **other equivalent** qualification recognized by the **Government of Malaysia** and approved by the **Senate of IPTA**. or
   Passed the **Malaysian High School Certificate (STPM)** in year 2016 or earlier with minimum result of:-
   - **Grade C (NGMP 2.00)** General paper
   - **Grade C (NGMP 2.00)** in two (2) other subjects

iii. Passed Matriculation examination in year 2015 or earlier with minimum of **CGPA 2.00**.

iv. Passed the Malaysian University English Test (MUET) with minimum result of **Band 1**.

Special Requirements of the Programme:

i. Obtained a **Diploma in Civil Engineering from UTM**/equivalent with a minimum **CGPA of 2.70**; or for candidates with a CGPA below 2.70 but have a minimum of **two or more years of working experience** in the related area of study will be eligible to apply for a place to study at the university.

ii. Obtained a **credit pass in Mathematics** in their SPM/equivalent examination or a minimum **grade C** in any of the Mathematics Courses taken at the diploma level.

iii. Passed the Malaysian University English Test (MUET) with minimum result of **Band 2**.

iv. No disabilities which inhibit physical activities.

v. Candidates are required to submit the results transcript of all their examinations taken during their Diploma study (semester one until the final semester) to UTM. A copy of the diploma or a letter of completion of study will also have to be submitted

together with their applications.

Note: - Year of entry and duration of study will be based on the credit exemptions and credit transfer awarded by the university.

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Competent, innovative and entrepreneurial in acquiring and applying knowledge towards solving Civil Engineering problems.
PEO2	Possess leadership qualities, able to work, manage in diverse teams and serve the society in multi-disciplinary environment.
PEO3	Professionalism and uphold ethical values with emphasis on sustainable environment.
PEO4	Communicate effectively, possess strong self-confidence and recognize the need for life-long learning.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to the solution of complex engineering problems
PLO2	Identify, formulate, conduct research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1 toWK4)
PLO3	Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5)
PLO4	Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions
PLO5	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6)
PLO6	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7)
PLO7	Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts. (WK7)
PLO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7)

PLO9	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings
PLO10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PLO11	Demonstrate knowledge and understanding of engineering management principles and economic decision making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments
PLO12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

CROSS-CAMPUS PROGRAMME

Students are given the opportunity to enroll in a few courses in participating universities. The grades and credits obtained during this period are transferable (up to 1/3 of the total credits of the curriculum). Currently, there are four participating universities i.e. Universiti Teknologi Malaysia, Universiti Sains Malaysia, Universiti Malaya and Universiti Malaysia Sarawak.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

(i) The total number of credits allowed to be taken is between twelve (12) and sixteen (16) credits only.
(ii) The student should hold a minimum CGPA of 3.00 at the time of application.
(iii) The student is not a residence of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However should the participating university provide accommodation, the student will need to pay accommodation fees

COURSE MENU

YEAR 1 : SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 1011	Introduction to Civil Engineering	1	
SEAA 1213	Engineering Mechanics	3	
SEAA 1513	Fluid Mechanics	3	
SSCE 1693	Engineering Mathematics I	3	
UHMT 1012	Graduate Success Attributes	2	
UHLB 1112	English Communication Skills	2	**MUET – BAND 1, 2 & 3**
UHMS 1182	Appreciation of Ethics and Civilizations (For Local Students Only)	2	

UHIS 1022/ UHMS 1182	Philosophy and Current Issues Appreciation of Ethics and Civilizations (For International Students Only)		
UKQ# 2##2	Co-Curriculum & Service Learning	2	
TOTAL CREDIT		**18**	
CUMULATIVE CREDITS		**18**	

YEAR 1 : SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 1023	Engineering Surveying	3	
SEAA 1422	Engineering Drawing	2	
SEAA 1713	Soil Mechanics	3	
SSCE 1793	Differential Equations	3	
SSCE 1993	Engineering Mathematics II	3	
UBSS 1032	Introduction to Entrepreneurship	2	
UHIS 1022	Philosophy and Current Issues (For Local Students Only)	2	
UHLM 1012	Malay Language 2 (For International Students Only)		
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**36**	

YEAR 1 : (SHORT SEMESTER)			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 1031	Surveying Camp	1	SEAA 1023
TOTAL CREDIT		**1**	
CUMULATIVE CREDITS		**37**	

YEAR 2 : SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 2012	Civil Engineering Laboratory 1	2	
SEAA 2032	Mechanical and Electrical Systems	2	
SEAA 2513	Hydraulics	3	
SEAA 2722	Geotechnics 1	2	SEAA 1713
SEAA 2832	Highway Engineering	2	SEAA 1713
SEAA 2912	Water Treatment	2	
SSCE 2393	Numerical Methods	3	
UHLB 2122	Advanced Academic English Skills	2	UHLB1112
TOTAL CREDIT		**18**	
CUMULATIVE CREDITS		**55**	

YEAR 2 : SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 2112	Civil Engineering Materials	2	
SEAA 2223	Mechanics of Materials and Structures	3	SEAA 1213
SEAA 2413	Computer Programming	3	SEAA 1422
SEAA 2712	Engineering Geology and Rock Mechanics	2	SEAA 1713
SEAA 2922	Wastewater Engineering	2	
SSCE 2193	Engineering Statics	3	
UHIT 2302	The Thought of Science and Technology	2	
TOTAL CREDIT		**17**	
CUMULATIVE CREDITS		**72**	

YEAR 3 : SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 3123	Construction Technology, Contract & Estimating	3	
SEAA 3243	Theory of Structures	3	SEAA 2223
SEAA 3313	Reinforced Concrete Design 1	3	SEAA 2223
SEAA 3412	Building Information Modelling and Data Management	2	SEAA 2413
SEAA 3712	Geotechnics	2	SEAA 2722
UHLX 1122	Elective of Foreign Language	2	
UKQT 3001	Extracurricular Experiential Learning (EXCEL)	1	
TOTAL CREDIT		**16**	
CUMULATIVE CREDITS		**88**	

YEAR 3 : SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 3012	Civil Engineering Laboratory 2	2	
SEAA 3022	Integrated Design Project 1	2	All SEAA Year 1 and Year 2 courses
SEAA 3323	Structural Steel & Timber Design	3	
SEAA 3613	Hydrology and Water Resources	3	SEAA 1513
SEAA 3842	Traffic Engineering	2	
SEAA 3913	Environmental Management	3	
UHLB 3132	English for Professional Purpose	2	
TOTAL CREDIT		**17**	
CUMULATIVE CREDITS		**105**	

YEAR 3 : (SHORT SEMESTER)			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 3045	Industrial Training	5	All Basic Civil Engineering Core Courses
TOTAL CREDIT		**5**	
CUMULATIVE CREDITS		**110**	

YEAR 4 : SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 4021	Civil Engineering Seminar	1	
SEAA 4022	Research Methodology and Pre-Project	2	
SEAA 4032	Integrated Design Project 2	2	SEAA 3022
SEAA 4333	Reinforced Concrete Design 2	3	SEAA 3313
SEAA 4**3	Elective 1	3	
SEAA 5**3	PRISMS Elective 1		
TOTAL CREDIT		**14**	
CUMULATIVE CREDITS		**124**	

YEAR 4 : SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEAA 4034	Final Year Project	4	SEAA 4022
SEAA 4113	Constructions & Project Management	3	
SEAA 4223	Structural Analysis	3	SEAA 3243
SEAA 4**3	Elective 2	3	
SEAA 5**3	PRISMS Elective 2		
SEAA 4**3	Elective 3	3	
SEAA 5**3	PRISMS Elective 3		
TOTAL CREDIT		**13**	
CUMULATIVE CREDITS		**137**	

Subject to change

Notes: - L – Lecture; T – Tutorial; P/S – Practical/Studio; Lab – Laboratory

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

Elective Courses

Apart from the core course, students must also take 9 credits of elective course.

1. Materials, Management and Construction

SEAA 4143 Construction Plants and Equipment
SEAA 4153 Offshore Structures
SEAA 4163 Concrete Technology

2. Structural Analysis and Design

SEAA 4203 Stability and Dynamics of Structures
SEAA 4243 Finite Element Method
SEAA 4263 Earthquake and Wind Engineering
SEAA 4273 Maintenance of Seismic Structures and Materials
SEAA 4293 Advanced Solid Mechanics
SEAA 4323 Prestressed Concrete Design
SEAA 4383 Analysis and Design of Tall Building Systems

3. Information Technology

SEAA 4433 Advanced Computer Programming
SEAA 4463 Construction Integration Environment
SEAA 4473 Geographic Information System

4. Hydraulics and Hydrology

SEAA 4523 Coastal Engineering
SEAA 4613 Water Resources Management
SEAA 4633 Groundwater Hydrology

5. Geotechnics and Transportation

SEAA 4723 Engineering Rock Mechanics
SEAA 4733 Advanced Foundation Engineering
SEAA 4813 Pavement Design and Construction
SEAA 4823 Transportation Planning

6. Environmental Engineering

SEAA 4923 Advanced Water and Wastewater Treatment
SEAA 4943 Solid Waste Management
SEAA 4973 Industrial and Hazardous Waste Treatment
SEAA 4983 Water Quality Management

PRISMS ELECTIVE COURSES

For students who intend to enroll into PRISMS programme, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programmes.

1. Construction Management

SKAB 5113 Construction Law and Contract
SKAB 5123 Construction Site Management and Safety Control
SKAB 5133 Sustainability & Environment Management in Construction

2. Project Management

SKAB 5143 Stakeholders Communication and Management
SKAB 5153 Project Planning & Scheduling
SKAB 5163 Project Financial Management

3. Structure

SKAB 5213 Advanced Structural Analysis and Modelling
SKAB 5233 Structural Dynamics
SKAB 5323 Advanced Design of Steel Composite Structures
SKAB 5313 Advanced Design of Reinforced Concrete

4. Hydraulics and Hydrology

SKAB 5513 Advanced Hydraulics
SKAB 5613 Advanced Hydrology
SKAB 5623 Urban Stormwater Management

5. Geotechnics

SKAB 5713 Advanced Soil Mechanics
SKAB 5723 Geotechnical Analysis & Design
SKAB 5733 Slope Engineering

6. Transportation

SKAB 5813 Highway and Infrastructure Design
SKAB 5823 Advanced Road Material
SKAB 5833 Traffic Management & Analysis

7. Environmental

SKAB 5913 Environmental Management & Sustainability
SKAB 5923 Land use and Environmental Planning
SKAB 5933 Air and Noise Pollution

8. Forensic

SKAB 5173 Laws in Forensic Engineering
SKAB 5223 Risk Analysis

COURSE SYNOPSIS

CORE COURSES

First Year

SEAA 1011 - Introduction to Civil Engineering

This course is only offered in the 1st Semester to all new students of Faculty of Civil Engineering. The course includes a general introduction to the field of civil engineering and the engineer's responsibilities to society. Main subfields in the discipline such as Structural Engineering, Transportation and Geotechnical Engineering, Hydraulics and Hydrology and Environmental Engineering will be highlighted by experts of the respective subfields. The course also exposes the students to generic skills related to engineering practices such as team working, making ethical decisions and communication skills through the lectures and group projects. Prior to the weekly lectures and presentations, a special welcoming lecture will be given by the Dean of Faculty.

SEAA 1023 - Engineering Surveying

This course provides the basic theory and practice of surveying to civil engineering students. Methods of establishing horizontal & vertical control for construction and design are explained, compared and practiced via fieldworks. Since accuracy of survey work is vital in ensuring designs are exactly positioned, students must be able to analyse errors so that standard accuracies are met. Detailing for producing site plans, area and volume estimations, road curves geometric design are also discussed. The concept of field survey automation and the usage of software are explained. At the end of the course, students are expected to be able to plan, execute, compute and analyse surveying works involved in establishing horizontal & vertical controls and producing plans for civil engineering applications. Students should also be able to geometrically design horizontal and vertical curves according to standards, perform area calculations and volume estimation for earthwork activities in civil engineering.

SEAA 1031 - Surveying Camp

Pre-requisite: SEAA 1023 Engineering Surveying

After successfully completing course SKAA 1023, students are well exposed to the theory and practice of surveying. Nevertheless, surveying projects that were undertaken so far are 'stand-alone' projects with emphasis on the understanding of the concepts involved. Therefore, this subject provides training of the surveying work involved in a typical civil engineering project. In other words, this subject gives a holistic view of the surveying activities needed prior to and during the construction stage of a civil engineering project. The course will furthermore, train students in planning and executing survey works on a larger scale.he surveying works involved depend on the type of project undertaken, but normally include establishing horizontal and vertical controls, detailing, earthwork calculations and setting out. Students are assessedbased on their oral presentation and written reports submitted at the end of the course. This subject introduces the basics and concepts of surveying in general with emphasis towards engineering surveying. Basic surveying needs commonly required in civil engineering are explained. Methods of establishing horizontal & vertical controls, detailing for producing site plans, area and volume estimations, road curves geometric design and setting out are

discussed. Students are introduced to the typical field tasks as required in civil engineering. Common methods of field procedures, bookings and reduction of observations are adopted. Students are expected to be able to establish horizontal and vertical controls, setting out and detailing. The importance of surveying field activities prior to the design and during the construction stages in civil engineering work is highlighted. Since accuracy of survey work is vital in ensuring designs are exactly positioned, students must be able to conduct survey works that meet standard accuracies.

SEAA 1213 - Engineering Mechanics

The course is designed to expose the students to the basic principles of statics and dynamics. The subject is divided into two parts: Mechanics of Statics and Mechanics of Dynamics. The content of the lecture will be emphasized on the application of the basic mechanics principle in civil engineering. Mechanics of Statics deals with equilibrium of bodies, i.e. bodies at rest and bodies moving with a constant velocity. It includes resultant and resolution of forces, equilibrium of a particle, force system resultant, equilibrium of rigid bodies, center of gravity and centroid, and moment of inertia of an area. Mechanics of Dynamics deals with the accelerated motion of bodies. It includes kinematics and kinetics of a particle and of a rigid body. Kinematics discusses the relationship between displacement, velocity and acceleration against time. Kinetics covers the concepts of force and acceleration (Newton's second law of motion), energy and work, impulse and momentum, and vibration. At the end the course, students should be able to incorporate and utilize principles of applied mechanics in civil and structural engineering problems.

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SEAA 1422 - Engineering Drawing

This course is designed to expose the students to the basic understanding of technical and engineering drawings. It will cover the aspect of understanding and interpretation of the element of drawings. The concept of orthographic and isometric projection will be discussed and applied in the hands-on session with Computer Aided Drawing (CAD). Students will also be exposed to the civil works drawings, i.e. the earthworks, reinforced concrete detailing and structural steel detailing drawings. Several exercises are performed with the use of CAD to get the students acquaintance of the software. During this session, students will be asked to

draw and submit group projects that are given to them. After completing this course students should be able to produce civil engineering drawings using CAD

SEAA 1513 - Fluid Mechanics

This course is designed to introduce and apply the concepts of Fluid Mechanics (fluid statics and kinematics, forces and flow in closed conduits, pipe networks and centrifugal pumps) and to solve problems related to Civil Engineering. It encompasses topics such as fluid statics and fluid dynamics. The pressures and forces in these static and dynamic fluids are introduced, discussed and analysed through equations. It also covers upon the analyses of flows in closed conduits to include minor and major head losses. The performance characteristics, functions and applications of centrifugal pumps in pipeline systems are also demonstrated and analysed in this course.

SEAA 1713 - Soil Mechanics

This subject is a compulsory subject for civil engineering students. The content of this subject will give a student basic understanding and exposure towards practical in Geotechnical Engineering. It will cover on basic soil properties which, consists of soil composition, soil classification and soil compaction. Besides that, it will also discuss on vertical stresses in soil due to overburden and external loading, water in soil and soil shear strength. The topic that will cover is important to civil engineers where most of problems occur at site will involve with geotechnical and soil mechanics. At the end of this subject, students will able to apply the knowledge on basic soil properties, soil classification and compaction properties, water in soil and shear strength parameters in the planning, analysis, design and supervision of related geotechnical works.

Second Year

SEAA 2012 - Civil Engineering Laboratory 1

Civil engineering is a practical field and the laboratory work is essential to be performed by students in this field. The laboratory work, which consists of workshops and experiments are designed to expose students essential problem solving and experimental techniques. Most of the generic attributes that the students must develop at the University are acquired through the laboratory experiments and researches. Laboratory sessions are able to strengthen the students to relate the fundamental theories with laboratory experiments in the field of concrete, transportation, hydraulics, and structural engineering. Each student will experiences data collections and performs data analysis and result interpretations. Application of the experimental results to the real civil engineering problem will be highlighted. Upon completion of the course, students are expected to be able to perform laboratory experimental work and investigation in concrete, transportation, hydraulics and structural engineering, to develop the techniques of conducting measurements, data analysis and interpret results in written report, and to develop generic attributes and enhance their ability to participate effectively in a laboratory environment and be able to work as part of a team.

SEAA 2032 - Mechanical and Electrical Systems

This course is a service course from the Faculty of Mechanical Engineering & the Faculty of Electrical Engineering. The course will exposed civil engineering students to the fundamentals of Mechanical & Electrical building services. The topics to be covered in the Mechanical Portions are design of Domestics Water Supply System, Fire Prevention System, Ventilation and Air-Conditioning System and Lift and Escalators System. Students will be exposed more on design using professional charts and codes and catalogues from manufacturers. The electrical portion of the course covers single phase and three phase system followed by an insight to transformer and induction motor operation. The electrical section will also cover the commercial practice of electrical wiring and substation design. At the end of the course, students should be able to demonstrate the understanding of electrical system and machines operation and ability to design domestic wiring system.

SEAA 2112 - Civil Engineering Materials

This course is designed for students to understand the different types of construction materials used in civil engineering. It will emphasize on types, properties, and function of cement, aggregates, water, admixtures in concrete; properties of fresh and hardened concrete, concrete mix design method, manufacturing concrete on site; test of hardened concrete; timber - properties, characteristics, manufacturing, and applications, masonry - types and characteristics of brick and block, mortar in masonry work, ferrous and non-ferrous metal, and other latest materials in construction industry. At the end of the course students should be able to describe, identify and discuss the properties and behavior of different types of civil engineering materials together with the selection of the right materials for applications in practice.

SEAA 2223 - Mechanics of Materials and Structures

Pre-requisite: SEAA 1213 Engineering Mechanics

This is a core subject. Students will be able to understand the basic theory of the fundamental principles of mechanics of materials. Students will be able to incorporate these basic fundamentals into application of the basic design of simple structures. It will assure them of the concepts of stress and strain, plane-stress transformation, shear force and bending moment, stresses in beams, and deflections of beams, vibration of beams, columns, and torsion. At the end of the course, the students should be able to solve numerous problems that depict realistic situations encountered in engineering practice. The students will also be able to develop and master the skills of reducing any such problem from its physicaldescription to a model or symbolic representation to which the principles may be applied.

SEAA 2413 - Computer Programming

This course is designed to expose the students on the development of programming skill using a computer language, which is suitable for the current computer operating system. It will emphasize on the general concept of computer programming that includes steps of problem solving using computer, algorithm and program logic tools, interface design, modularization, arrays, files and graphics. Examples, assignments and group projects related to various civil engineering fields are given to the students. At the end of the course, the student should be able to plan, analyze, and write computer programs for basic civil engineering applications.

SEAA 2513 - Hydraulics

Hydraulics is one of the major disciplines of civil engineering. This course introduces the concepts of open channel fluid flow and their applications in hydraulics engineering problems. It covers various aspects of open channel hydraulics including types of open channel flow, design of channel section dimensions, uniform and non-uniform steady flows. Dimensional analysis and the principle of hydraulic similitude in physical modelling are also included. At the end of the course, students should be able to apply the knowledge in solving civil engineering hydraulics problems.

SEAA 2712 - Engineering Geology and Rock Mechanics

Pre-requisite: SEAA 1713 Soils Mechanics

This course is designed to enable students to evaluate, to apply and to analyze the relevant geological and rock mechanics principles in designing safe and economical rock engineering structures. In geology, the related topics on rock types/classifications, geological structures and geological processes are taught. Having acquired this knowledge, the principles of rock mechanics are then introduced mainly to highlight the relevancy of engineering properties of geological materials in designing rock engineering projects. These principles include engineering properties of rock material, rock discontinuities and rock stabilization systems. At the end of the course, students should acquire the related knowledge and principles in geology and rock mechanics, and should be able to apply these knowledge and principles in designing safe and economic engineering structures in rock masses.

SEAA 2722 - Geotechnics I

Pre-requisite: SEAA 1713 Soil Mechanics

This course is one of the core courses, which provides solid background knowledge on the properties and behavior of soils for geotechnical engineering practice. Understanding of the course will help the students in designing civil and geotechnical engineering structures. Topics for the course are stresses in soils, compressibility and consolidation of soils, and slope stability. At the end of the course, students should be able to analyze and apply the related theories of soil behavior, and to solve problems of stresses on retaining structures, consolidation settlement and slope stability.

SEAA 2832 - Highway Engineering

Pre-requisite: SEAA 1713 Soil Mechanics

This is one of the compulsory courses which will expose students to the fundamental theory of highway engineering. Topics covered are highway materials and evaluations, premix plants, construction techniques and plants, mix designs, quality controls and testing, pavement structural thickness design, highway drainage, pavement visual assessment, maintenance and rehabilitation.

SEAA 2912 - Water Treatment

This course is designed to expose the students to water treatment technology. Topics discussed include basic water quality requirement, water characteristics, water treatment process and supply, and design of unit water treatment systems. For design of water treatment system, it will cover the design of unit treatment operation. Other than treatment methods, the course also discuss on the water distribution.

SEAA 2922 - Wastewater Engineering

The course is designed to expose the students to wastewater treatment technology. The course will emphasize on basic environmental microbiology, characteristics of wastewater, wastewater analysis, design of conventional wastewater treatment systems and sludge treatment. For design of wastewater treatment systems, it will cover the design of clarifier, waste stabilization pond, conventional activated sludge, extended aeration, sequential batch reactor, aerated lagoon and trickling filters. The course also covers the sewage quality standards under Environmental Quality Act 1974. The course exposes students to select the suitable wastewater treatment systems for certain application. At the end of the course, the students should be able to apply the knowledge to design a simple unit operation of wastewater treatment systems and also to modify existing unit operation.

Third Year

SEAA 3012 - Civil Engineering Laboratory 2

Civil engineering is a practical field and the laboratory work is essential to be performed by students in this field. The laboratory work, which consists of workshops and experiments are designed to expose students essential problem solving and experimental techniques. Most of the generic attributes that the students must develop at the University are acquired through the laboratory experiments and researches. Laboratory sessions are able to strengthen the students to relate the fundamental theories with laboratory experiments in the field of concrete, transportation, hydraulics, and structural engineering. Each student will experiences data collections and performs data analysis and result interpretations. Application of the experimental results to the real civil engineering problem will be highlighted. Upon completion of the course, students are expected to be able to perform laboratory experimental work related to civil engineering such as; concrete, transportation, hydraulics, environmental, geotechnical and structural engineering, to develop the techniques of conducting measurements, data analysis and interpret results in written report, and to develop generic attributes and enhance their ability to participate effectively in a laboratory environment and be able to work as part of a team.

SEAA 3022 - Integrated Design Project 1

Pre-requisite: All SEAA 1### and SEAA 2### courses

Integrated Design Project 1 is tailored to encourage students to explore the inception and conceptual planning stage of a civil engineering development project. The subject focuses on site and utility planning of a development project given to students, working in groups. Such exercise may include developing a survey plan. For the specific proposed site, developing a general drainage and sewerage plan including evaluation of and connection to existing infrastructure and possible need for sewage lift station, proposing location and type of soil investigation to be carried out, producing preliminary road and utility cross sections and recommending any improvements to ease traffic congestion, developing an environmental mitigation plan including sittings of detention ponds and wetlands, to consider alternatives for sustainable design, evaluate the impact of relocating existing utility services and producing a preliminary project design schedule showing milestones and critical path.

The scope and brief of the proposed development will be as reflective of a real life development project. Students are required to integrate their knowledge of civil engineering disciplines such as (but not limited to) geotechnical engineering, highway and transportation, waste water engineering, and sustainable development considerations into their overall project work. At the end of this course, the students will be able to comprehend the importance of proposing a viable and workable development project and appreciate the importance of integration and synthesis of various discipline of civil engineering knowledge.

SEAA 3045 - Industrial Training
Pre-requisite: All Basic Civil Engineering Core Courses
Industrial Training is a core course which will assign students to work with industries for a period of 12 weeks. The training aims to exposed students to real civil engineering practices such as project planning and design, construction management and site supervision and other fields of specialization. Students will gain knowledge and working experience as well as improving their interpersonal skills through working with professionals from the industries. Depending on the nature of work, the students will have opportunity to apply theories learnt in the lecture room into real civil engineering practices.

SEAA 3123 - Construction Technology, Estimating & Contract
This is a compulsory course. This course emphasizes on the principles of construction in building and civil engineering works, which consists of site preparation and layout, earthwork activities, construction of various building elements such as foundations, floors, walls and roofs. It also covers other important aspects in construction i.e formworks and scaffoldings. General concepts on industrialized building systems including precast, prestressed and modular coordination in construction are also introduced. The syllabus also covers the introduction to the methods of estimating and the preparation of the Bills of Quantities and project estimating. At the end of the course, the students should be able to describe and distinguish the various building elements, techniques and systems used in a construction and also to be able to estimate the cost of the building elements. The students should also be able to demonstrate capability of working in a team and some acquirement of contemporary knowledge

SEAA 3243 - Theory of Structures
Pre-requisite: SEAA 2223 Mechanics of Materials
This course introduces students to the analysis of determinate and indeterminate structures in civil engineering. The course emphasizes on the analysis of beams and frame structures subjected to various load conditions by using classical techniques. The course is limited to the linear elastic analysis of beam and frame structures except in plastic analysis where the critical loads at failure are being examined. Students will also be taught on the use of influence diagrams to solve problems involving determinate beams subjected to moving loads. At the end of the course, students should be able to apply the knowledge and use the classical techniques for solving problems in structural engineering

SEAA 3313 - Reinforced Concrete Design I
Pre-requisite: SEAA 2223 Mechanics of Materials
This is a core course which will provide an understanding and ability to analyze and design reinforced concrete structural elements. Among the topics discussed are reinforced concrete as a sustainable construction materials, objective and methods of design, code of practice, analysis and design of sections for moments and shear, checking for deflection and cracking, durability and detailing requirements, design of simply supported and continuous beams, design of one way and two way restrained and simply supported slab. Furthermore the students will be exposed to the concept of prestressed concrete which covers topics on principle and methods of prestressing, stress limit, losses and selection of section.

SEAA 3323 - Structural Steel & Timber Design
This is a core subject. Students will able to incorporate and utilize technology in the analysis and design of steel and timber structures It will expose the students to the analysis and design of steel and timber structural elements. For the steel design, the topics covered include the advantages and the general concepts of steel constructions, analysis and design of restrained and unrestrained beams, columns with axial load, columns with axial load and bending moment, trusses, bolt and weld connections. For timber structures, the topics covered include the design of beams and columns.

SEAA 3412 - Building Information Modelling and Data Management
Pre-requisite: SEAA 1422 Engineering Drawing
This course is designed to introduce the concept and principles of Building Information Modelling (BIM), the utilization of BIM technology in the architecture, engineering and construction (AEC) industry, and future trends of BIM developments. BIM is not only a technology that is dramatically changing the way AEC projects are delivered today, but also involves more integrated processes and parties (considering clients, designers and planners, owners and other stakeholders throughout the project life cycle). This course is also designed to expose the students in analysing, designing and developing the huge of data. It concerns on the management of information and how to model it in a structured manner. The used of database system as an application tool give the student a further step in order to apply an IT application in solving their problems. This course also exposes the knowledge on the usage, management and sharing of data and information to ensure that information is manipulated and used effectively. The aim of the course is to give students a practical, hands-on introduction to BIM and data management techniques for the documentation and modelling of designed structures. At the end of the course, students should be able to plan, analyze, and modelling the data to develop the BIM model and data management related to civil engineering problems.

SEAA 3613 - Hydrology and Water Recourses
Pre-requisite: SEAA 1513 Fluid Mechanics
The course emphasizes hydrology and its application in the field of engineering especially those related to water resources. Interdisciplinary aspects of hydrology that will be introduced and discussed are the understanding of the hydrological processes. These processes are precipitation, evaporation, transpiration, surface runoff, groundwater flow, infiltration and interception. Some processes will be discussed in more detail as compared to the others. An introduction to flood estimation will be highlighted together with the basic analysis and concept

design in accordance to local guideline of Urban Storm water Management Manual for Malaysia (MASMA). Frequency analysis will be discussed in this subject. A brief introduction to the hydrologic modeling processes will be introduced as a basic requirement to the understanding to the empirical and numerical modeling concepts. Upon completion of the course, students are expected to be able to describe and assess all the physical processes found in the hydrologic cycle together with the basic quantitative hydrologic analysis methods.

SEAA 3712 - Geotechnics 2
Pre-requisite: SEAA 2722 Geotechnics 1
This course will provide students with sound knowledge on site investigation and foundation designs for civil and geotechnical engineering structures. The main topics of the course are site investigations, shallow foundations and pile foundations. The importance of site investigation for safe and economic foundation designs will be emphasized. Methods, procedures and planning of effective site investigation will be addressed. The topic of shallow foundation will be based on Terzaghi's theory and Meyerhof's general bearing capacity equation, which will include the effects of ground water and eccentric load. Static formulae (Meyerhof' method, α and β methods) and dynamics formula will be introduced to determine single pile capacity in different soil conditions. Capacity and efficiency of pile group in different soils will be addressed.

SEAA 3842 - Traffic Engineering
This is one of the compulsory courses which will expose students to the fundamental theory of traffic engineering. The main content of the course provides students with the fundamental theory of traffic flow and management. Major topics include drivers' behavior and interactions, fundamental theory of speed–flow–density relationships and applications in road performance analysis, traffic studies, design of traffic signal control system, and highway geometric design.

SEAA 3913 - Environmental Management
The course is designed to expose the students to various aspects in environmental pollution and concepts of environmental management. The course will emphasize on discussion in different aspects of environmental component including water, air, soil and waste management. The important and impacts on type of energy usage towards the environment will also be covered in this course. Various pollution control and prevention methods, environmental regulations as well as the implementation and concept in the environmental impact assessment (EIA) in achieving sustainable development will also be among the important aspect of this course. Upon completion, students should be able to demonstrate and apply the knowledge by the ability to identify specific pollution control technology and methods and the processes in preparing an environmental impact assessment (EIA) report. The students should be able to synthesize the knowledge in a group project and demonstratea cooperative effort while working in a team as well as develop good relationship and interaction with colleagues and work effectively with other people to achieve mutual objective.

Fourth Year

SEAA 4013 - **Advanced Engineering Surveying**
Pre-requisite: SEAA1023 Engineering Surveying
SKAB1031 Survey Camp

This course provides the theory and practice of advanced surveying to civil engineering students. Methods of surveying measurement using modern and advanced technology civil engineering designs and projects are discussed The applications of precise levelling, 3D terrestrial laser scanning (TLS), global positioning system (GPS), photogrammetry and hydrographic surveying in typical civil engineering projects are highlighted. Deformation surveys, which are often required in dilapidation surveys is also discussed. The theory of error propagations and their adjustments are also discussed. Relevant fieldworks are conducted to enhance students' grasp of the theory. At the end of the course, students are expected to apply advanced measurement techniques in solving positioning and dimensioning problems in civil engineering.

SEAA 4021 - Civil Engineering Seminar

This course is designed as a compulsory attending course, which is carried out based on a seminar format. Speakers from universities and from within the practicing civil engineering-based organizations will be invited to talk on specialized topics and issues in various civil engineering field including safety and health. At the end of the course, student should be able to understand the actual civil engineer practices in civil-engineering based activities, and adhere to professional ethics.

SEAA 4022 - Research Methodology and Pre-Project

This course is a compulsory course for all students before they undergo the Final Year Project. In this course, the student will be exposed in various aspect of research including types of research, method of literature review, research design, results and analysis, writing of thesis and journal and also presentation skills. The students will also be exposed to the problem solving methodology, decision-making and data collection process. This helps to prepare the students for Final Year Project. The student has to prepare a Pre-Project proposal report in the topic that will be given by their supervisors. At the end of this course, students should be able to understand all aspects of research, conduct research in a systematic way, solve and analyze data and results and write and present pre-project proposal report.

SEAA 4032 - Integrated Design Project 2
Pre-requisite: SEAA 3022 Integrated Design Project 1

Integrated Design Project 2 (IDP 2) is tailored to expose and familiarize students to a feasibility study and preliminary design of a civil engineering development project that has been developed previously in Integrated Design Project 1 (IDP 1) (conceptual planning stage). The aim of the Feasibility Study phase is to determine the optimum scheme from a technical, economic, environmental, and construction view. A Feasibility Study Report is the minimum expected output of this phase. The Feasibility Report shall encompass all the engineering attributes developed in the Planning Stage (IDP 1) and shall propose several options. Each option shall then be investigated to measure its capability to sufficiently address the project constraint aspects and the optimum scheme determined. The chosen scheme will then be developed to the stage of producing a Detailed Design Brief to be adopted at the final

Integrated Design Project phase (SKAA 4042). Such exercise shall in part maintain the continuity of the IDP project series. At the end of this course, the students will be able to comprehend the importance of reviewing and selecting a feasible technical proposal and appreciate the importance of integration and synthesis of various discipline of civil engineering knowledge.

SEAA 4034 - Final Year Project
Pre-requisite: SEAA 4022 Research Methodology and Pre-Project
This course is compulsory for all students before they can get their Bachelor Degree. In this course, the student is expected to be able to conduct research activity independently with supervision from their supervisor. The students are also required to write a good thesis report and be able to present their project findings effectively. At the end of the course, students should be able to conduct research in a systematic way, collect data relating to the project, solve and analyze data to obtain results, write a good project report and present project findings.

SEAA 4113 - Construction and Project Management
This course aims to develop understanding on the importance of construction management principles and its related tools. The course starts with understanding the general perspective of management issues and processes and their relationship to construction. The construction project life cycle together with the roles and responsibilities of professionals involved at each stage will be discussed. The Knowledge, Skills, Roles and Ethical responsibilities of a project manager will be explained. The second part of the course will include the usage of tools available in construction management particularly in the application of planning and scheduling technique using Gantt chart and networking technique. The course will also expose the students to the application of popular scheduling software. The third part of the course is dedicated to the application of scheduling technique related to resource management, resource allocation and project time cost trade-off. The last important topic involves analyzing the project cash flow requirements, project monitoring and control. New Academia Learning Innovation (NALI) such as case study teaching will also be implemented.

SEAA 4223 - Structural Analysis
Pre-requisite: SEAA 3243 Theory of Structures
This course is designed to expose the students in analysing the two-dimensional structures using a matrix operational method and computer applications. The matrix operational method is also suitable to be programmed in computers as the solutions adopt the matrix concept. The course consists of the flexibility method, the stiffness method, concept for solving matrices, an introduction to finite element method and also structural modelling using existingsoftware. The structures include beams, trusses and frames. At the end of the course, students should be able to analyse the structures by using the numerical methods and/or theexisting computer software. The students should also have a problem solving skill on problemsof interest in Civil Engineering structures.

SEAA 4333 - Reinforced Concrete Design 2
Pre-requisite: SEAA 3313 Reinforced Concrete Design 1
This course is a core course which will exposed students to a wider scope of reinforced concrete design. As a continuation to the Reinforced Concrete Design 1, the topics to be covered are design of staircase, design of column, design of footing and pile cap and design of retaining walls. Furthermore the students will exposed to the method of analysis of reinforced concrete frame.

Synopsis of Faculty's Elective Courses

SEAA 4143 - Construction Plants and Equipment
This course introduces the techniques of applying engineering fundamentals and analyses to the planning, selection and utilization of construction equipment. In general, the right selection, efficient utilization and cost- effectiveness of major construction operations have significant impacts on the overall cost and duration of construction activities. This course uses concepts from various engineering disciplines such as Engineering Economics, Geotechnical, Mechanical, Structural and Environmental Engineering, among others. At the end of this course, the students should be able to apply engineering fundamentals and analyses to the planning, selection and utilization of construction equipment. This includes a thorough understanding on the total construction process and how construction equipment should be selected and used to produce the intended quality in the most cost-effective manner.

SEAA 4153 - Offshore Structures
Pre-requisite: SEAA 3243 Theory of Structures
SEAA 3352 Reinforced Concrete Design 1
SEAA 3323 Structural Steel & Timber Design
This course emphasizes on the overview of offshore structural engineering related to oil and gas industry by covering vast amount of fundamental topics such as Front-end engineering design (FEED), Environmental loads, Response of Structures to environmental loading, Analysis and Design of Offshore Steel platforms, Analysis and Design of Offshore Topside Modules, Construction of Steel Platforms, Load-out, installation, hook- up and commissioning of offshore structures, Inspection, repair and Maintenance, Structural assessment of existing structures as well as removal of disused structures.

SEAA 4163 - Concrete Technology
This course is designed to introduce students and enhance their knowledge on concrete technology. It will emphasize on the rheology of fresh concrete, the various design of concrete mixes, the different types and properties of cement replacement materials, special concretes which include fiber reinforced concrete, high strength concrete, lightweight aggregate concrete, and polymer concrete. Other topics that will be covered include concrete deformations, durability of concrete, and repair of concrete structures due to various causes of deterioration. At the end of the course students should be able to identify, discuss and apply the materials and technology available in producing good concrete that is suitable for different applications.

SEAA 4203 - Stability and Dynamics of Structures
Pre-requisite: SEAA 3243 Theory of Structures
SEAA 4223 Structural Analysis

This is an elective course that is offered to final year undergraduate students. The structural dynamics covers introduction, natural frequency, single degree of freedom, multi-degree of freedom system, Eigenvalues and Eigenvectors, free vibration response. Structural instability covers concept, simple model, Euler column instability, stability functions, Bolton Method and Horne Method. At the end of the course the students should be able to solve numerous problems which involves dynamics and instability. The students will also be able to develop and master the skills of reducing any problems from its physical description to a model or symbolic representative to which the principles may be applied.

SEAA 4243 - Finite Element Method
Pre-requisite: SEAA 4223 Structural Analysis

This course is developed to expose students to the fundamental theory and application of the finite element method. The course covers linear analyses for displacements and stresses in continuum structures. Formulation of stiffness matrices for one-dimensional elements, beams, plane stress and plane strain are presented in detail. Grillage, plate bending, shell, Axisymmetric and solid elements are also discussed. Isoperimetric formulation is emphasized. Use of finite element software for modeling and analysis is also emphasized. At the end of the course, students should be able to apply the finite element method by hand calculation for simple problems. For more complicated problems, the students should be able to create finite element model, choose correct elements, analyze and interpret results using Finite Element software. Students also should be able to analyze practical problems by implementation through final project and make class presentation to demonstrate their understanding about the course materials.

SEAA 4263 - Earthquake and Wind Engineering

This is an optional course. In the early stage, introduction to structural design and dynamic effect from wind and earthquake is revealed. Steps and method of structural design for wind load will be discussed. Then, engineering aspect in seismology will be discussed.Other than that, seismic reaction on structure, general consideration on earthquake resistant design and seismic behavior of structural system will be taught. Students will also be introduced with the permanent earthquake resistant design and structural earthquake resistant design. Lastly, some issues on special topics in Earthquake Engineering will be discussed.

SEAA 4273 - Maintenance of Seismic Structures and Materials

This is an optional subject. This subject gives an introduction on seismic maintenance and concepts related to it. Dynamic analysis with computer will also be introduced. Topics related including non-linear seismic analysis, structure and earth interaction, base separation and energy dissipation device.

SEAA 4323 - Prestressed Concrete Design
Pre-requisite: SEAA 3352 Reinforced Concrete Design I
This is an elective course, which will provide students an understanding and ability to analyze and design prestressed concrete structural elements. Topics discussed include the concept and principles of prestressing, methods of prestressing concrete, stress limits, losses of prestress, and selection of section, serviceability and strength requirements. Students will also be exposed to the complete analysis and design procedure of simply supported prestressed concrete non-composite and composite beams, and design principles of continuous beams.

SEAA 4383 - Analysis and Design of Tall Building Systems
The subject emphasized on the analysis and design of tall buildings structural system. It covers a fundamental to tall building structures and related issue in analysis and design fromaround the world. The students will be guided through the Code of Practice basic requirementof analysis and design of tall buildings. The ultimate behavior, analysis and design of tall building structural elements such as from basic element of reinforced concrete plates,formation of frames structures, composition of shear walls and core wall of structures will be checked and explain before the students are guided through the real analysis and design of various shapes of buildings. Finally, detailing of shear walls and core walls will be explained together with the behavior of infills of frame structures.

SEAA 4433 - Advanced Computer Programming
Pre-requisite: SKAA 3413 Computer Programming
This course is designed to expose the students in designing and developing computer program using suitable programming languages such as visual basic and active server pages. It will emphasize on the general concepts of computer programming, steps of problem solvingusing computer program, advanced interface design, graphic, multimedia, animation, database design and web programming. The course will also provide hands- on session for the students to solve tutorials and problems given that related to civil engineering fields. At theend of the course, students should be able to understand the steps in problems solving and apply the knowledge to identify and analyze civil engineering problems that require computer programming solutions. The students should also be able to design and write the computer program to solve the problems.

SEAA 4463 - Construction Integration Environment
Pre-requisite: SKAA 3412 Building Information Modelling and Data Management
This subject is concerns on the Integrated Construction Environment (ICE) which involve coordinating the integration process between various construction applications. Such environment will provide a platform whereby the Architectural, Engineering and Construction (AEC) can share and exchange the information. The progress of information technology (IT) in the construction industry relies on the ability of the project participants to exchange and share information among themselves and managing Information System (MIS).The student is expected to gain some knowledge on the Computer Integrated Construction (CIC) which is an emerging technology to automate the flow and exchanging of construction project information. They will be exposed to Information Modeling, E-Construction, Internet, Networking, Artificial Intelligent and Groupware. The used of database management system (DBMS) and Standardization to manipulate the information will give the student a further step in order to apply an IT application in solving their construction problems. In the new development on the

current research and development (R&D), the applications of IT in the construction are becoming more important, especially in the new era of globalization. Therefore, the new generation of civil engineers should be equipped with this knowledge to stay competitive in the industry equipped with this knowledge to stay competitive in the industry.

SEAA 4473 - Geographic Information System

This course is an elective course specially designs for civil engineering students who always have to manipulate huge amount of spatial data. It concerns on the management of information (spatially and attribute) and how to model it in a structured manner. This course will emphasize on the overview and the application of GIS in civil engineering, GIS data structure, data manipulation and GIS implementation, information presentation of GIS, and a review of GIS software and sample of application. The development of a prototype system is also been highlighted in this course in order to give the student a proper technique for developing an application. At the end of the course, students will be able to plan, analyze, and modeling the information for develop GIS application related to civil engineering problems.

SEAA 4523 - Coastal Engineering

Pre-requisite: SEAA 2513 Hydraulics

The course covers theoretical and fundamental principles of coastal hydrodynamics and processes. It gives background knowledge of the various hydrodynamic parameters acting in the coastal region due to waves, tides and currents. Sediment transport mechanism in the littoral zone leading to the understanding of coastal morphology, erosion and accretion processes are described. Underlying principles of coastal engineering works, coastal erosion management and implications from implementing coastal structures in the coastal environment are delivered. Emphasis in solving and tackling coastal engineering problems adopts the use of established analytical techniques. The application of state-of-the-art computational techniques as a tool in several aspects of coastal engineering and management works are introduced. At the end of the course, students should be able to describe and analyze the various coastal processes and the effect of these forces on the coastal zone. The students should be able to quantify coastal environmental parameters. They should also be capable of proposing methods to control the processes using analytical techniques and evaluate results yielded by computational techniques when applied to solve coastal engineering problems.

SEAA 4613 - Water Resources Management

Pre-requisite: SEAA 1513 Fluid Mechanics

SEAA 3613 Hydrology and Water Recourses

This is an elective course aim to equip students with in-depth knowledge in water resources design and management. This course highlights major water resources management issues with the emphasis on the integration of various management components. While the course contents maintain the technical elements of water resources system and engineering, students are also exposed to the realities of the political, economic, and social settings that influent the decision making process. Upon completion of this course, the students should be able to demonstrate the diverse and complicated issues in water resource management, discuss the need and steps for integrated management approach, analyze and determine viable project

options, propose appropriate management strategies, and apply the appropriate techniques and strategies in reservoir planning and design.

Synopsis of Faculty's PRISMS Elective Courses

SKAB5113 - Construction Laws and Contract

This course introduces students to Malaysia laws, which will focus on the sources, and branches of law in Malaysia. The course will emphasize on private laws related to construction practice, torts, law of contract and construction contract administration. Students will be exposed to construction contract administration which covers the Standard Forms of Contract, disputes in construction and dispute resolutions. At the end of the course, students should possess a sound knowledge of the Malaysian legal framework and familiar with legislative and legal constraints applicable to the practice of construction. More importantly, the students should be able to use their knowledge to promote ethical and better image of the construction industry

SKAB 5123 - Construction Site Management and Safety Control

The course is designed to educate the student on the construction site management and occupational health and safety (OHS) concept. The course is divided into two parts namely site management and safety control. First part will emphasize on site management particularly principles of site management, site performance, site reporting, monitoring and control, site layout, workers' welfare and site resources. The second part will focus on the accident theories, prevention and investigation, risk management, OHS Management, performance and culture, occupational health such as stress and ergonomics within construction projects. Upon completion, students should be able to apply the effective site management and practice the knowledge Occupational Health & Safety Management and Accident Prevention within construction projects.

SKAB 5133 - Sustainability & Environment Management in Construction

The developments of building and infrastructure have inherent links with the environment. Land, materials, water, energy are all consumed during the construction operation of buildings and infrastructure. The constructed facilities than become part of the new environment we have to live with. The process also generates greenhouse emissions which cause damage (e.g. global warming) to our environment. This subject offers an inter-disciplinary elective designed to promote collaboration and enhance understanding of the global challenge of sustainable development that related to construction industry. The course will emphasise on sustainability and environmental management within construction related issues as promoted by Agenda 21. The subject will cover aspects of embodied energy (renewable & non renewable), energy efficiency in building, construction waste, construction noise, water pollution, biodiversity and various sustainability control and prevention method for construction. Thus environmental regulations & legislation; environmental Impact Assessment (EIA) and Environmental Management System (EMS) will be incorporated into the subject. At the end of the course, students are expected to able to understand the principles of sustainable development and apply knowledge to plan, design and construct using sustainable concepts and methods.

SKAB 5143 - Stakeholders Communication and Management

This course focuses on project personnel building and maintaining robust project relationships by using appropriate tools to identify key stakeholders and then to manage the relationships between their unique stakeholders community and the project. The course is designed to expose students to both the methodology and the supporting theory to provide students with a thorough understanding of both stakeholder and communication theory and practice in a project environment and how effective management of these factors will contribute to a successful project outcome.

SKAB 5153 - Project Planning & Scheduling

This course provides knowledge on contemporary practice in project planning and scheduling process in managing construction project. Major software for project planning and scheduling will be used. Student will be taught to develop project schedule and WBS then use advance technique to monitor and track project performance against baseline schedule. The concept and application of Earn Value Management system will be taught and the student will be able to appraise project performance from time to time and recognised major delay and budget control.

SKAB 5163 - Business Planning and Financial Management

This course discusses the basic concepts of accounting and financial management, methods of financial statement analysis, evaluation of financial assets in terms of risk and return, and short- term and long-term capital management of an organization.

SKAB 5213 - Advanced Structural Analysis and Modelling

This is a core course in the Structural Engineering Program that exposes the students to matrix methods for advanced structural analysis and solving many structural problems. The types of structures involved are beams, trusses and frames. Three dimensional structures are also included. This course also includes the application of matrix method for nonlinear geometric or second order elastic analysis and critical load prediction of structures. The applications of matrix methods for nonlinear material analysis of frame structures are also included in this course

SKAB 5323 - Advanced Design of Steel Composite Structures
Pre-requisite: SKAB 3243 Theory of Structures
SKAB 3323 Design of Steel and Timber Structures

This course intends to give an extensive understanding to the students in the advanced design of steel structures which are the multi-storey steel frames, composite beams, plate girder, and portal frame. Eurocodes (EN 1993 and EN 1994) will be employed as the standards for design. The design of multi-storey steel frames covers mainly the design aspects of braced and unbraced frames. In the design of unbraced frames, a special method called a Wind-Moment method is introduced. For braced frames, three aspects of design namely simple, semi-continuous, and continuous construction are discussed and compared to give a better picture on the economic aspects of the design. Details of the design of the frames include the analysis and design of the frames for columns, beams, connections, bracing system, column and beam splices. The course also covers the design of composite beams by using linear and stress block interaction method which include the interaction of

shear stud as full strength and partial strength. The design of plate girder is also included to cater for heavy load transferred to a long span or “column free” construction of multi-storey steel frames and bridges. Lastly, the design of portal frame is covered with the focus on single span symmetrical frame.

SKAB 5313 - Advanced Design of Reinforced Concrete
Pre-requisite: SKAB 4333 Reinforced Concrete Design 1
This course is intended to provide extra knowledge on the aspect of design of reinforced concrete structural elements. As a continuation to the Reinforced Concrete Design 1 and 2, the topics discussed are analysis and design of ribbed, waffle and flat slabs, water retaining structures, shear walls, corbel and nibs. Furthermore students will be exposed to the methods of deflection calculation, design of elements for torsion and design of raft foundations.

SKAB 5513 - Advanced Hydraulics
Pre-requisite: SEAA 1513 Fluid Mechanics
This course is designed to introduce advanced concepts of fluid mechanics in relation to viscous flows. It covers laminar flows, transition to turbulence and turbulent flows and will be taught with civil engineering applications in mind. The students should understand the topics of open channel flow, friction and sediment transport from the fundamental point of view. In this course, unsteady flow in open channels and pipes - topics of specific interest to civil engineers – will also be covered.

SKAB 5613 - Advanced Hydrology
SEAA 3613 - Hydrology & Water Resources
The study in hydrological processes and systems, include the rainfall, evapotranspiration, infiltration, soil water processes and overland flow. Aspect of rainfall-runoff processes and hydrologic routing are discussed and how these are modelled for use in flood estimation. Various rainfall-runoff models are reviewed. The surface water quality aspect also covered.

SKAB 5623 - Urban Stormwater Management
Pre-requisite: SEAA 1513 Fluid Mechanics
SEAA 3613 Hydrology & Water Resources
The course covers the theoretical aspects and design of urban storm water drainage system. It is intended to introduce students to the fundamentals of storm water drainage system design. Methods of hydrologic design, rainfall design, flood estimation, rainfall-runoff relationship and flood routing will be taught. This will involve the planning, analysis, design and management for the quantity aspect.

SKAB 5713 - Advanced Soil Mechanics
This subject is one of the elective subjects for civil engineering students, which will provide: the advanced knowledge on the application and principles of soil mechanics. It considers the following topics: soil and clay mineralogy, strength behaviour of cohesionless and cohesive soils. Mohr-Coulomb failure criterion, peak stresses, effective stress ratio, residual stress and critical state soil mechanics. Principles of the laboratory measurement. Consolidation theory and pore pressure parameters. Difference between 1-D and 3-D Consolidation theory and introduction of unsaturated Critical state soil mechanics.

SKAB 5723 - Geotechnical Analysis & Design
Pre-requisite: SKAB 1713 Soil Mechanics
SKAB 2722 Rock Mechanics

This course, offered by the Department of Geotechnics and Transportation, will provide advanced knowledge on the analysis and design of geotechnical engineering structures such as the earth dam, earth retaining structures, embankment on soft soils and tunneling through soils. It includes evaluating poor ground conditions and propose alternative technique(s) for ground improvement such as the sand drain, vertical drains, geosynthetics, soil reinforcement, electro-osmosis and others. Practical solution to problems which often confronted during construction in difficult ground area will also be highlighted. The course explores examples of the construction and post-construction data for the purposes of performance, safety and design compatibility. Slope and embankment stability; natural and manmade slopes, earth dams and embankments on soft clay, will be lay out in this course. Earth retaining structures for deep excavation, brace cut, gravity cantilever, buttress and reinforced earth wall and cantilever and anchored sheet pile will also be included. Besides that, the analysis and design of tunneling work through soil and the earth dam on various foundation soil types will be demonstrated. Lastly, the geotechnical instrumentation for monitoring of the geotechnical engineering structures will be explored

SKAB 5733 - Slope Engineering
Pre-requisite: SKAB 1713 Soil Mechanics
SKAB 2722 Rock Mechanics

This course provides a comprehensive introduction to the subject of slope stability, from initial classification through assessment and analysis to remediation. It provides the student with the knowledge, strategy and capability to inspect, understand and assess slope instability. The course covers both the theory and practice of slope engineering. This course is ideal forthose involved in the design, analysis or construction of civil engineering projects where the existence, creation or alteration of slope features may occur.This course considers the background to slope movements, simple classification systems and the fundamental soil mechanics that control stability. The key parameters are highlighted and discussed. The principles and assumptions of the more popular methods of analysis are introduced together with a pragmatic guide for assessing the competence of analysis software. Specific problems covered, include natural and cut slopes, earthworks and fills. It's also focusses on the practical approach to slope stability assessment and remediation. The investigation of failed slopes is considered. Remedial options to arrest or prevent movement are detailed together with a section on modeling. Techniques for the back analysis of slopes are covered and the application of stability calculations for suction assessment explored

SKAB 5813 - Highway and Infrastructure Design

This course provides state of art knowledge on highway and infrastructure design. Understanding of the subject will help the students to design highways and related infrastructure facilities. Topics for the subject are intersection design including roundabout design, intersection control system, highway surveys and location, geometric design of roads and highway facilities and also road cross section design. At the end of the course, students are able to analyse and apply the related theories in order to design highway and infrastructure facilities.

SKAB 5823 - Advanced Road Material

This is one of the core subjects that will enhance the knowledge of the students on advanced road materials. The course consists of the following topics i.e., asphalt mixture (HMA, WMA, CMA), premix plant (types and operation), modified asphalt, rubberised asphalt, nanotechnology and its impact on road construction, durability of asphalt premix, asphalt mixture specification and testing, emulsified, cutback and foamed asphalt, road maintenance, and quality control and acceptance of asphalt mixtures.

SKAB 5833 - Traffic Management & Analysis

This course discusses urban traffic and transportation management strategies. It addresses the basic traffic and transportation data collections, analysis and the fundamental theory of traffic flow, capacity assessment of transportation facilities and the transportation systems management (TSM) planning processes and strategies. TSM includes Advanced Traffic Management (ATM), Urban Traffic Control System (UTCS), Intelligent Transport and Traffic System (ITS) and Highway Information System.

SKAB 5913 - Environmental Management & Sustainability

This course is designed to expose students to various aspects in environmental management and the concept of sustainability. Topics discussed include the principles of sustainable development, understanding the environmental sensitive areas particularly the natural water bodies, catchment management, development of coastal and inland areas. Current issues related to environmental problems especially on climate change and water supply are the main aspects to be addressed. Some methods and concepts of sustainable approaches are introduced in order to promote and achieve sustainable development goals. At the end of the course, the students should be able to understand the concept of environmental sustainability and present it through an effective communication. The course enables the students to understand, plan and incorporate the concept of sustainability in environmental management.

SKAB 5923 - Land use and Environmental Planning

This course covers the fundamental concepts and mechanisms underlying land use and environmental planning from conceptual to its implementation. It focuses on the understanding of ecosystems, the impacts of land development activities along with the appropriate tools/techniques of environmental planning and management used to mitigate them. It provides an overview of the field, along with the fundamentals of land use planning, and presents a collaborative approach to environmental planning while explaining the principles of ecosystem management, restoration, and protection; land conservation; and the mitigation of natural hazards.

SKAB 5933 - Air and Noise Pollution

This course is designed to expose students with a comprehensive understanding in elements involved in air and noise pollution, and the practical approaches to control the pollution. In the air pollution part, topics discussed include elements and phenomena of air pollution, meteorology, control of air pollution and design considerations. In a noise pollution part, topics discussed include elements of noise pollution, effects, types of noise pollution, road traffic & aircraft/industrial noise. At the end of the course, students should acquire the fundamental knowledge related to the principles and control strategies of air and noise pollutions.

SKAB 5173 - Laws in Forensic Engineering

This course introduces students to laws related to the professional engineering practices. The course will emphasize on two main liabilities; tort, and statutory liabilities. The role of professional as expert witness will be introduced in law of evidence so as the students will be familiar to the role of expert witness and the procedures involved during experts at trial. The focus will be on building a credible and believable testimony. At the end of the course, the students are expected to understand the legal setting in the practice and be able to analyse and apply critical reasoning and make informed judgement in addressing legal issues in engineering practice and to stand as credible expert witness.

SKAB 5223 - Risk Analysis

This courses aims to give students a comprehensive exposure to structural safety, risk assessment and reliability engineering concept related to civil engineering system. The course contents consist of four different module named Systems Reliability, Safety & Risk, Data Analysis & Simulation and Risk Assessment & Safety Management. Safety & Risk leads to an understanding of the principles of structural reliability theory and its application to risk and reliability engineering. Data Analysis & Simulation is designed to develop knowledge of statistical data analysis and its application in engineering and science and introduces the concepts of using simulation techniques for analysis of complex systems. It also teaches linear optimization techniques and the ability to apply them to solve simple problems. In Systems Reliability, this section gives an understanding of the qualitative and quantitative techniques that are used in the reliability, availability and maintainability analysis of all types of engineering systems. The final part of this course, Risk Assessment & Safety Management gives student an appreciation of risk from individual and societal perspectives as well as understanding the basic principles of risk assessment and modelling and how safety management works in practice.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

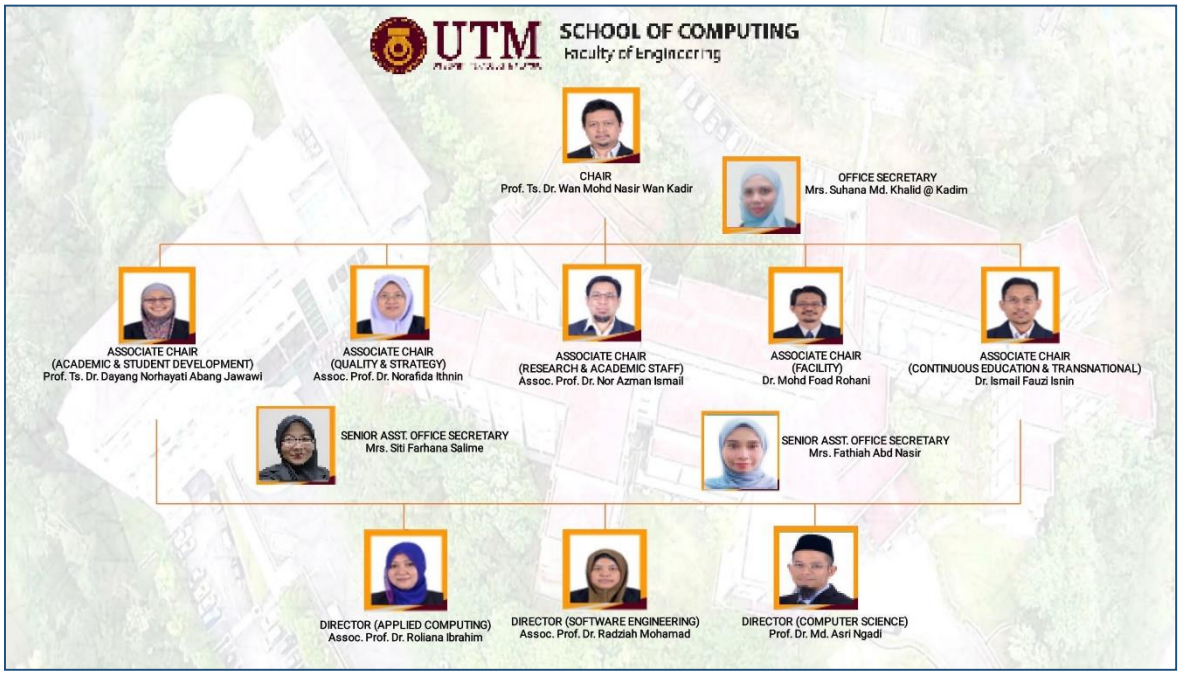
NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
SCHOOL OF CIVIL ENGINEERING COURSES					
1	SEAA 1011	Introduction to Civil Engineering	1	1	
2	SEAA 1023	Engineering Surveying	3	3	
3	SEAA 1031	Survey Camp (YEAR 1 / SHORT SEMESTER)	1	HL	
4	SEAA 1213	Engineering Mechanics	3	3	
5	SEAA 1422	Engineering Drawing	2	2	
6	SEAA 1513	Fluid Mechanics	3	3	
7	SEAA 1713	Soil Mechanics	3	3	
8	SEAA 2012	Civil Engineering Laboratory 1	2	2	
9	SEAA 2032	Mechanical & Electrical Systems	2	2	
10	SEAA 2112	Civil Engineering Materials	2	2	
11	SEAA 2223	Mechanics of Materials and Structures	3	3	
12	SEAA 2413	Computer Programming	3	3	
13	SEAA 2513	Hydraulics	3	3	
14	SEAA 2712	Engineering Geology and Rock Mechanics	2	2	
15	SEAA 2722	Geotechnics 1	2	2	
16	SEAA 2832	Highway Engineering	2	2	
17	SEAA 2912	Water Treatment	2	2	
18	SEAA 2922	Wastewater Engineering	2	2	
19	SEAA 3012	Civil Engineering Laboratory 2	2	2	
20	SEAA 3022	Integrated Design Project 1	2	2	
21	SEAA 3045	Industrial Training (YEAR 3 / SHORT SEMESTER) for 12 weeks / 3 months	5	HL	
22	SEAA 3123	Construction Technology, Estimating & Contract	3	3	
23	SEAA 3243	Theory of Structures	3	3	
24	SEAA 3313	Reinforced Concrete Design 1	3	3	
25	SEAA 3323	Structural Steel & Timber Design	3	3	
26	SEAA 3412	Building Information Modelling and Data Management	2	2	
27	SEAA 3613	Hydrology and Water Resources	3	3	
28	SEAA 3712	Geotechnics 2	2	2	
29	SEAA 3842	Traffic Engineering	2	2	

30	SEAA 3913	Environmental Management	3	3	
31	SEAA 4021	Civil Engineering Seminar	1	HL	
32	SEAA 4022	Research Methodology and Pre-Project	2	2	
33	SEAA 4034	Final Year Project	4	4	
34	SEAA 4032	Integrated Design Project 2	2	2	
35	SEAA 4113	Construction & Project Management	3	3	
36	SEAA 4223	Structural Analysis	3	3	
37	SEAA 4333	Reinforced Concrete Design 2	3	3	
38	SEAA 4**3	Elective 1	3	3	
39	SEAA 5**3	PRISMS Elective 1			
40	SEAA 4##3	Elective 2	3	3	
41	SEAA 5**3	PRISMS Elective 2			
42	SEAA 4##3	Elective 3	3	3	
43	SEAA 5**3	PRISMS Elective 3			
TOTAL CREDIT OF CIVIL ENGINEERING COURSES (a)			101	94	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
5	SSCE 2393	Numerical Methods	3	3	
TOTAL CREDIT OF MATHEMATICS COURSES (b)			**15**	**15**	
UNIVERSITY GENERAL COURSES					
Kluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1	UHMS1182	Appreciation of Ethics and Civilizations (for Local Students Only)	2	2	
	UHIS1022 OR UHMS 1182	Philosophy and Current Issues (for International Students only) OR Appreciation of Ethics and Civilizations (for International Students			
2	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
Cluster 2: Generic Skills					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UBSS 1032	Introduction to Entrepreneurship	2	2	

3	U**2**2	Soft Skills Elective	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT 2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQ* 2**2	Co-Curriculum & Service Learning	2	2	
2	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB 1112	English Communication Skills	2	2	1
2	UHLB 2122	Academic Communication Skills	2	2	2
3	UHLB 3132	Professional Communication Skills	2	2	3
4	UHL* 1112	Elective of Foreign Language	2	2	4
TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)			**21**	**21**	
TOTAL CREDIT TO GRADUATE (a + b + c)			**137**	**130**	
OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC).					
Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	Faculty Engineering Safety Pass (FESP) *MODULE 1 - compulsory for SKM, SKT and SKE students* *MODULE 2 – compulsory for SKA, SC, SKBSK students*			
4	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
ELECTIVE PSC COURSE (Choose 1 only)					
1	GSPX XXXX	Data Analytics for Organization			
2	GSPX XXXX	Writing			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical Works)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	More elective courses to be added in future			

SCHOOL OF COMPUTING

MANAGEMENT TEAM



Position	Name
Chair	Professor Ts. Dr. Wan Mohd Nasir Wan Kadir wnasir@utm.my 07-5532000
Associate Chair (Academic and Student Development)	Associate Professor Ts. Dr. Dayang Norhayati Abang Jawawi dayang@utm.my 07-5538768
Associate Chair (Research and Academic Staff)	Associate Professor Dr. Nor Azman Ismail azman@utm.my 07-5538772
Associate Chair (Quality and Strategy)	Associate Professor Dr. Norafida Ithnin afida@utm.my 07-5538767
Associate Chair (Continuous Education and TNE)	Dr. Ismail Fauzi Isnin ismailfauzi@utm.my 07-5538816
Associate Chair (Facility)	Dr. Mohd Fo'ad Rohani foad@utm.my 07-5538815
Director (Applied Computing)	Associate Professor Dr. Roliana Ibrahim roliana@utm.my 07-5538770
Director (Software Engineering)	Associate Professor Dr. Radziah Mohamad radziahm@utm.my 07-5538769

Director (Computer Science)	Professor Dr. Md Asri Ngadi dr.asri@utm.my 07-5538752

BACHELOR OF COMPUTER SCIENCE (BIOINFORMATICS) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Computer Science (Bioinformatics) with Honours is offered on a full-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fourteen (14) to eighteen (18) credit hours per semester. Assessment is based on coursework and final examination given throughout the semester.

General Information

1. Awarding Institution			**Universiti Teknologi Malaysia**	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Computer Science (Bioinformatics) with Honours	
4. Final Award			Bachelor of Computer Science (Bioinformatics) with Honours	
5. Programme Code			SECBH	
6. Professional or Statutory Body of Accreditation			Ministry of Higher Education	
7. Language(s) of Instruction			English	
8. Mode of Study (Conventional, distance learning, etc)			Conventional	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum : 4 yrs (8 semesters) Maximum : 6 yrs (12 Semesters)	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	20	8	14
Short	-	-	-	-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses a. General b. Language c. Co-Curriculum d. IT Entrepreneurship	 10 8 3 2	17.6%
ii.	Core Courses	74	56.4%
iii.	Elective Courses	34	26.0%
	Total	**131**	**100%**
A	Engineering Courses (a) Lecture/Project/Laboratory (b) Workshop/Field/Design Studio (c) Industrial Training (d) Final Year Project	Nil	Nil
Total Credit Hours for Part A			
B	Related Courses (a) Applied Science/ Mathematic/ Computer (b) Management/Law/Humanities/ Ethics/Economy (c) Language (d) Co-Curriculum	Nil	Nil
Total Credit Hours for Part B			
Total Credit Hours for Part A and B		**Nil**	
Total Credit Hours to Graduate		**131 credit hours**	

Award Requirements

To graduate, students must:

- Achieve a total of 131 credit hours with minimum CPA of 2.0.
- Pass industrial training (equivalent to 12 credit hours), which 4 credits will be graded and 8 credits as HW status.
- Complete Bioinformatics Project I and II.
- Pass 5 Professional Skills Certificate (PSC).

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Obtain employment as computer scientist in local and global industries and organization, where they are competent in applying the fundamental knowledge, computational principles and skills in Bioinformatics to develop software of increasing size and complexity across different application areas.
PEO2	Demonstrate an ability to continue to learn throughout their career (i.e. professional, technical or postgraduate education) which can straighten their analytical and critical thinking skills to position them to advanced Computer Science and Bioinformatics and to contribute to the intellectual foundations of the Computer Science and Bioinformatics disciplines.
PEO3	Involve in Bioinformatics and related a number software project that they are proficient in applying theoretical computing and knowledge in analysing, modelling, designing, developing and evaluation computing and bioinformatics solutions.
PEO4	Becoming leaders or technopreneurs in computer science and bioinformatics disciplines with combination skills
PEO5	Demonstrate an awareness of professional ethics and social responsibility as computer scientists specialising in bioinformatics.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Attain advanced knowledge to solve critical issues of a field in Computing and Bioinformatics.
PLO2	Critically solve and manage complex problems using systematic approaches.
PLO3	Adapt technical and scientific skills to solve problems in a field of Bioinformatics.
PLO4	Demonstrate effective collaboration with stakeholders professionally.
PLO5	Use a broad range of information, media and technology to support study.
PLO6	Competently use digital technologies and software to support research works or studies.
PLO7	Analyse numerical and graphical data using quantitative or qualitative tools in solving problems.
PLO8	Demonstrate leadership, autonomy and responsibility in conducting and managing research and resources.
PLO9	Self-advancement through continuous academic or professional development.
PLO10	Initiate entrepreneurial project with relevant knowledge and expertise.
PLO11	Demonstrate respectable ethical conducts and professionalism skills in an organization and society.

COURSE MENU

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECI1013	Discrete Structure	3	
SECJ1013	Programming Technique I	3	
SECP1513	Technology & Information System	3	
SECR1013	Digital Logic	3	
UHMT1012	Graduate Success Attributes	2	
MALAYSIAN STUDENTS			
UHIS1022	Philosophy and Current Issues	2	
UHMS1182	Appreciation of Ethics and Civilizations	2	
INTERNATIONAL STUDENTS			
UHIS1022	Philosophy and Current Issues	2	
UHMS1182	Appreciation of Ethics and Civilizations		
UHLM1012	Malaysia Language for Communication 2	2	
TOTAL CREDITS		**18**	
CUMULATIVE CREDITS		**18**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECI1113	Computational Mathematics	3	
SECI1143	Probability & Statistical Data Analysis	3	
SECJ1023	Programming Technique II	3	SECJ1013
SECR1033	Computer Organization and Architecture	3	SECR1013
SExBxxx3	SECB Core Elective #1	3	
UHLB1112*	English Communication Skills	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**35**	
** Students with minimum score of IELTS Band 5.5, TOEFL 525, TOEFL iBT 60, CEFR B2 and MUET Band 4 can apply for credit exemption for UHLB1112.*			

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECD2523	Database	3	
SECD2613	System Analysis and Design	3	
SECJ2013	Data Structure and Algorithm	3	SECJ1023
SECR2213	Network Communications	3	
SECV2113	Human Computer Interaction	3	
UKQFxxx2	Service-Learning Co-curriculum Elective	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**52**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECJ2203	Software Engineering	3	
SECV2223	Web Programming	3	
SECR2043	Operating Systems	3	SECR1033
SECJ2154	Object Oriented Programming	4	SECJ1023
UHLB2122	Academic Communication Skills	2	UHLB1112
SECBxxx3	SECB Core Elective #2	3	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**70**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
UHLB3132	Professional Communication Skill	2	UHLB2122
UHLx1112	Foreign Language Elective	2	
SECB3104	Applications Development	4	SECJ2203, SECD2523, SECV2223, SECJ2154
SECJ3553	Artificial Intelligence	3	SECJ2013
SECBxxx3	SECB elective 1	3	
SECBxxx3	SECB elective 2	3	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**87**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECB3032	Bioinformatics Project I	2	SECJ3104
SECJ3203	Theory of Computer Science	3	SECI1013, SECJ2013
UHIT2302	The Thought of Sciences and Technology	2	
UKQT3001	Extracurricular Experiential Learning (ExCEL)	1	
SExBxxx3	SECB elective 3	3	
SExBxxx3	SECB elective 4	3	
SExBxxx3	SECB elective 5	3	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**104**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECB4118	Industrial Training (HW)	8	92 credits CGPA >= 2.0
SECB4114	Industrial Training Report	4	
	TOTAL CREDIT	**12**	
	CUMULATIVE CREDITS	**116**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECB4134	Bioinformatics Project II	4	SECB3032
SECD3761	Technopreneurship Seminar	1	
UHAK1032	Introduction to Entrepreneurship	2	
Uxxx2xx2	General University Elective Course	2	
SExBxxx3	SECB elective 6	3	
SECx5xx3*	PRISM elective 1		
SExBxxx3	SECB elective 7	3	
SECx5xx3*	PRISM elective 2		
	TOTAL CREDIT	**15**	
	CUMULATIVE CREDITS	**131**	
*PRISM elective courses are for PRISM students only. Information on PRISM can be found here: https://engineering.utm.my/prism/ For non-PRISM students, you can register any SECB elective course offered.			

SECB ELECTIVES (choose 7)			
Code	**Course**	**Credit**	**Pre-requisite**
SEBB4203	Protein Biomolecules	3	
SEBB4193	Gene and Protein Technology	3	
SECB3032	Bioinformatics II	3	
SECB3203	Programming for Bioinformatics	3	
SECB3213	Bioinformatics Database	3	
SECB3133	Computational Biology I	3	
SECB3223	Computational Biology II	3	
SECB4243	Special Topics in Bioinformatics	3	
SECB4213	Bioinformatics Visualization	3	
SECB4313	Bioinformatics Modeling and Simulation	3	

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme. The PRISMS elective begins with code SECJ5xx3 / SECP5xx3 / SECR5xx3.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
COMPUTER SCIENCE COURSES					
CORE COURSES (74 CREDITS)					
1	SECI1013	Discrete Structure	3	3	
2	SECJ1013	Programming Technique I	3	3	
3	SECR1013	Digital Logic	3	3	
4	SCSP1513	Technology & Information System	3	3	
5	SECI1113	Computational Mathematics	3	3	
6	SCSI1143	Probability & Statistical Data Analysis	3	3	
7	SECJ1023	Programming Technique II	3	3	
8	SECR1033	Computer Organisation and Architecture	3	3	
9	SECD2523	Database	3	3	
10	SECD2613	System Analysis and Design	3	3	
11	SECJ2013	Data Structure and Algorithm	3	3	
12	SECR2213	Network Communications	3	3	
13	SECV2113	Human Computer Interaction	3	3	
14	SECJ2203	Software Engineering	3	3	
15	SECV2223	Web Programming	3	3	
16	SECR2043	Operating Systems	3	3	
17	SECJ2154	Object Oriented Programming	4	4	
18	SECB3032	Bioinformatic Project I	2	2	
19	SECJ3203	Theory of Computer Science	3	3	
20	SECB4118	Industrial Training	8	HL	
21	SECB4114	Industrial Training Report	4	4	
22	SECB4134	Bioinformatic Project II	4	4	
23	SECD3761	Technopreneurship Seminar	1	1	
ELECTIVES COURSES (34 CREDITS) – *Choose SECJ3104 and 10 other elective courses from the following list (which can include up to maximum of 4 PRISMS courses, for qualified students)*					
SECB ELECTIVES COURSES					
24	SECB3103	Bioinformatics I	3	3	
25	SECB3032	Bioinformatics II	3	3	
27	SECB3203	Programming for Bioinformatics	3	3	
28	SECB3213	Bioinformatic Database	3	3	
29	SECB3133	Computational Biology I	3	3	
30	SECB3223	Computational Biology II	3	3	
31	SECB4243	Special Topic in Bioinformatics	3	3	
32	SECB4213	Bioinformatics Visualization	3	3	

33	SECB4313	Bioinformatics Modeling and Simulation	3	3	
34	SECJ3104	Applications Development	4	4	
35	SECJ3553	Artificial Intelligence	3	3	
36	SECJ3303	Internet Programming	3	3	
37	SEBB4173	Cellular and Molecular Biology for Bioinformatics	3	3	
38	SEBB4203	Proteins Biomolecules	3	3	
39	SEBB4193	Gene and Protein Technology	3	3	
PRISMS ELECTIVES COURSES* *for PRISMS students only*					
40	SECR5013	Cryptographic Engineering	3	3	
41	SECR5023	Digital Forensics	3	3	
42	SECR5033	Information Security Governance and Risk Management	3	3	
43	SECR5043	Cloud Computing Security	3	3	
44	SECJ5013	Secure Software Engineering	3	3	
45	SECR5053	Penetration Testing	3	3	
46	SECJ5023	Advanced Theory of Computer Science	3	3	
47	SECJ5033	Advanced Data Structure and Algorithms	3	3	
48	SECJ5043	Advanced Artificial Intelligence	3	3	
49	SECP5013	Advanced Analytics for Data Science	3	3	
50	SECP5023	Big Data Management	3	3	
51	SECP5033	Business Intelligence and Analytics	3	3	
52	SECP5043	Data Science Governance	3	3	
53	SECP5053	Massive Mining and Streaming	3	3	
54	SECP5063	Statistics for Data Science	3	3	
TOTAL CREDIT OF COMPUTER SCIENCE COURSES (a)			**108**	**100**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
For Malaysian Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	
2	UHMS1182	Penghayatan Etika dan Peradaban	2	2	
For International Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	
	UHMS1182	Penghayatan Etika dan Peradaban			
2	UHLM1012	Malaysia Language for Communication	2	2	
Cluster 2: Generic Skills					
1	UBSS1032	Introduction to Entrepreneurship	2	2	
2	UHMT1012	Graduate Success Attributes	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT2302	The Thought of Science and Technology	2	2	

Cluster 4: Co-Curriculum and Service Learning					
1	UKQF2xx2	Service-Learning Co-curriculum Elective	2	2	
2	UKQT3001	Extracurricular Experiential Learning	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB1122	English Communication Skills	2	2	
2	UHLB2122	Academic Communication Skills	2	2	
3	UHLB3132	Professional Communication Skills	2	2	
4	UHLx1112	Foreign Language Elective	2	2	
Other University Electives					
1	Uxxx2xx2	Any 1 course from Cluster 2 or Cluster 3	2	2	
TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)			23	23	
TOTAL CREDIT TO GRADUATE (a + b + c)			131	123	

OTHER COMPULSORY COURSES		
No.	**PSC COURSE**	
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	
2	Talent and Competency Management	
3	English Communication Skills for Graduating Students (ECS)	
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	

COURSE SYNOPSIS

CORE COURSES

SECI1013 - Discrete Structure

This course introduces students to the principles and applications of discrete structure in the field of computer science. The topics that are covered in this course are set theory, proof techniques, relations, functions, recurrence relations, counting methods, graph theory, trees and finite automata. At the end of the course, the students should be able to use set theory, relations and functions to solve computer science problems, analyze and solve problems using recurrence relations and counting methods, apply graph theory and trees in real world problems and use deterministic finite automata finite state machines to model electronic devices and problems.

SECJ1013 - Programming Technique I

As a fundamental subject, this course equips the students with theory and practice on problem solving techniques by using the structured approach. Students are required to develop programs using C++ programming language, in order to solve simple to moderate problems. The course covers the following: pre-processor directives, constants and variables, data types, input and output statements, control structures: sequential, selection and loop, built-in and user-defined functions, single and two-dimensional arrays, file operations, pointers, and structured data types.

SECR1013 - Digital Logic

Digital electronics is the foundation of all microprocessor-based systems found in computers, robots, automobiles, and industrial control systems. This course introduces the students to digital electronics and provides a broad overview of many important concepts, components, and tools. Students will get up-to-date coverage of digital fundamentals-from basic concepts to programmable logic devices. Laboratory experiments provide hands-on experience with the simulator software, actual devices and circuits studied in the classroom.

SECP1513 - Technology & Information System

As a primer subject, this course will introduce students to information systems and technology (IS/IT), as well as its uses in daily life both at home and at work. Various aspects of IS/IT encompassing hardware, software, network, communications, internet, multimedia, graphics and systems applications will be introduced. Students will be equipped with basic skills in handling PC installation and productivity tools via practical work in the labs, which shall comprise a major part of the study. At the end of the course, student should be able to distinguish basic IS/IT component and applications.

SECI1113 - Computational Mathematics

This course is a combination of linear algebra and numerical methods as preparation for computer science student to apply mathematics knowledge in core knowledge of computer science. The first part of this course is an introduction to linear algebra. The topics that are covered in linear algebra are linear equations, linear combinations, linear independence, linear transformation, and vector spaces. The second part of this course covers numerical

methods that can be used to solve non-linear equation, linear systems, eigenvalue problems, interpolation, differentiation and integration. At the end of the course, students should be able to apply mathematics knowledge to solve mathematical problems. Implementation of engineering tools such as MATLAB, would enhance student to use simple programming technique for solving mathematical problems.

SCSI1143 - Probability & Statistical Data Analysis

This course is designed to introduce some statistical techniques as tools to analyse the data. In the beginning the students will be exposed with various forms of data. The data represented by the different types of variables are derived from different sources; daily and industrial activities. The analysis begins with the data representation visually. The course will also explore some methods of parameter estimation from different distributions. Further data analysis is conducted by introducing the hypothesis testing. Some models are employed to fit groups of data. At the end of course the students should be able to apply some statistical models in analysing data using available software.

SECJ1023 - Programming Technique II

Pre-requisite: SECJ1013 Programming Technique I

This course presents the concept of object orientation and object-oriented programming (OOP) techniques using the C++ programming language. It equips the students with the theory and practice on problem solving techniques using the object-oriented approach. It emphasizes on the implementation of the OOP concepts including encapsulations, associations and inheritance. At the end of this course, students should be able to apply the OOP techniques to solve problems.

SECR1033 - Computer Organisation and Architecture

Pre-requisite: SECR1013 Digital Logic

This course was designed to give the understanding of basic concept of computer organization and architecture. Topics covered in this subject will be on computer performance, types of data and the representative, arithmetic manipulation, instruction execution, micro programmable control memory, pipelining, memory, input/output and instruction format. At the end of this course, the student should be able to understand the concept of overall computer component and realize the current technology in computer hardware.

SECD2523 - Database

This course introduces students to the concept of database system and how it is used in daily human life and profession. The focus of the course is to equip students with the knowledge and skills on important steps and techniques used in developing a database, especially in the conceptual and logical database design phase. Among topics covered are database environment, database design, entity relationship diagram, normalization, and structured query language (SQL). Students will be taught to use a database management system (DBMS). Students are required to design and develop the database component of an information system using the learned techniques, DBMS and a development tool. At the end of the course, students should be able to apply the knowledge of designing and developing a good database system.

SECD2613 - System Analysis and Design

The main focus of this course is to provide a practical approach of systems analysis and designing skills for the students using structured methodology. Hence the course enables students to study information system requirements for any system application within an organizational context. The contents are sequentially organized directly from planning, analysis, designing and implementation phases. From the resulting output of the planning and analysis phase shall enable students to form input, output and interface design. Hence a prototype design can be demonstrated.

SECJ2013 - Data Structure and Algorithm

Pre-requisite: SECJ1023 Programming Technique II

This course emphasis on data structure concepts theoretically and practically with detail algorithms for each of data structure. Students will learn abstract data type concepts using class and apply the concept in the implementation of data structures. Apart from it, student will learn recursive concept as a programming style and algorithm efficiency analysis with Big O notation. Various sorting and searching techniques will be discussed as data structure operations. Analysis of each algorithm will also be explained. Further, students will be exposed to linear data structures such as linked lists, stack and queue. Non-linear data structures such as tree and binary search tree will be discussed. Along the course, students should be able to implement and apply the theory and concepts of data structure in the assignments and mini project which are conducted in group.

SECR2213 - Network Communications

This course will discuss the basic topics of computer network and data communications. Based on TCP/IP Internet protocol stack, the course will apply top-down approach. Starts with the important and usage of computer network in commonly applications, the approach will go further detail in the technical aspect in data communication. At the end of this course, students will have an understanding and appreciation of how the network works.

SECV2113 - Human Computer Interaction

This course will introduce students to human-computer interaction theories and design processes. The emphasis will be on applied user experience (UX) design. The course will present an iterative evaluation centered UX lifecycle and will introduce a broader notion of user experience, including usability, usefulness, and emotional impact. The lifecycle should be viewed as template intended to be instantiated in many different ways to match the constraints of a particular development project. The UX lifecycle activities we will cover include contextual inquiry and analysis, requirements extraction, design-informing models, design thinking, ideation, sketching, conceptual design, and formative evaluation.

SECJ2203 - Software Engineering

This course is designed to give students an introduction to an engineering approach in the development of high-quality software systems. It will discuss the important software engineering concepts in the various types of the common software process models. The students will also learn the concepts and techniques used in each software development phase including requirements engineering, software design and software testing. This course will also expose the students to utilizing object-oriented method (e.g. UML) and tools in

analyzing and designing the software. At the end of this course, students are expected to be able to appreciate most of the common software engineering concepts and techniques as well as producing various software artifacts, documentations, and deliverables.

SECV2223 - Web Programming

This course is designed to introduce students the fundamental of knowledge, technologies and components for web application developments. The basic topics includes the standard HTML for content creation, CSS for content presentation, JavaScript for client-side logics, PHP for server-side logics and MySQL for database processing. At the end of the course, the students should be able to apply the web base technologies and then implement it all in the creating functional data-centric online system project.

SECR2043 - Operating Systems

Pre-requisite: SECR1033 Computer Organization and Architecture

This course covers introduction to operating systems, which serve as an interface between computer hardware and the user. The operating system is responsible for the management and coordination of processes, sharing of limited resources of the computer. Students will be exposed to the techniques and algorithms that may be applied in designing an operating system. Topics covered include process management, concurrency and synchronization, deadlock, memory management, file management, secondary storage management and I/O management. At the end of the course, the student shall have a clear understanding on the general concepts that underlie of an operating system.

SECJ2154 - Object Oriented Programming

Pre-requisite: SECJ1023 Programming Technique II

This course presents the concepts of object orientation and object-oriented programming techniques using Java programming language. It provides students with a thorough look at the basic constructs of the Java programming language such as its basic data types and operations. It also emphasizes on the use of standard Java APIs that allow students to develop text-based and GUI applications. It will also provide the programming techniques on exception handling and input/output files. At the end of this course, students should be able to use the basic constructs in object-oriented programming and utilize the selected Java APIs.

SECB3032 - Bioinformatics Project I

This is the initial part of a 2-part Final Year Project that every student must fulfil successfully. Students are introduced to the methodologies of research and application development through a series of lectures. Students are guided through a step-by-step practice to complete the initial stages of proposal, planning and design of a project. Students must also meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their initial work.

SECJ3203 - Theory of Computer Science
Pre-requisite: SECI1013 Discrete Structure
SECJ2013 Data Structure and Algorithm

The goal of this course is to provide students with an understanding of basic concepts in the theory of computation. This course introduces students to formal languages and automata theory. It will emphasize on languages, grammars and abstract machines i.e. Regular Language, Context Free Language, Regular Grammar, Context Free Grammar, Finite Automata, Push Down Automata and Turing Machine. The course will also provide practice on the acceptability of input string by these machines. At the end of the course, students should be able to apply the theory in constructing these abstract machines and testing them with the right input strings.

SECB4118 - Industrial Training (HW)
Pre-requisite: 92 credits AND CGPA >= 2.0

Industrial Training refers to the placement of a student at an organization for a minimum of 20 weeks to elevate students' knowledge and skills in a specific database profession and at the same time produce graduates who are credible, creative and proficient. This course aims to provide a platform for the students apply their knowledge learned in the university and boost their skills which needed by a profession. It is also intended for the students to gain exposure in every aspect of real career life. The students will be evaluated based on two components; 1) student performance evaluation by organization supervisor and 2) student performance evaluation by faculty supervisor. The organization supervisor is expected to assess the student performance based on work performance and student's personality. The assessment by faculty supervisor more focusing on students' generic skills.

SECB4114 - Industrial Training Report
Pre-requisite: 92 credits AND CGPA >= 2.0

Industrial Training Report refers to the placement of a student at an organization for a minimum of 20 weeks to experience and apply their theoretical knowledge in the industrial training. The students will be evaluated based on four components; 1) technical report, 2) oral presentation, 3) logbook and 4) ethics. The aim of the technical report is to educate the students in producing related technical report and able to explain a specific detail on the tasks that have been done during the training. Students need to follow specified format in writing the technical report and submit it within the predetermined date. The students are required to present their training achievement to Industrial Training supervisors (organization and supervisor). Students need to fill in the online logbook daily for the purpose of close monitoring between the students and supervisors. Student also needs to practice the good ethical values and work conduct throughout the training. The passing mark is 60%.

SECB4134 - Bioinformatics Project II
Pre-requisite: SECB3032 Bioinformatics Project I

This is the second part of a 2-part Final Year Project that every student must fulfil successfully. In this installation, students are required to execute the next phases of their development plan from Part1. Students are now required to code and integrate the different modules that make up the proposed project. Students will test the developed modules and the final fully-integrated project following software development and research testing

practices. Students must meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their final work.

SECD3761 - Technopreneurship Seminar
This 1-credit course will provide module and training for students on how to generate digital income through crowdsourcing platforms and methods. Crowdsourcing is a method to generate online income which the work is offered and implemented digitally in global platforms.

ELECTIVE COURSES

SECB3103 - Bioinformatics I
This course introduces the basic knowledge of Bioinformatics to students. It includes theories, applications, and tools. Introduction to Bioinformatics describes bioinformatics theories and tools that can help solve biological problems. It also shows how to efficiently apply bioinformatics applications to bioinformatics data and evaluate the resulting information.

SECB3023 - Bioinformatics II
This subject familiarizes students with resources essential in examining how raw sequence data from genome sequencing projects can be used to generate information about gene sequence, protein structures, molecular evolution, biochemical, and genomics. It introduces existing DNA sequence and protein structure concepts and theories. Students will be exposed to bioinformatics methods and practices using appropriate bioinformatics tools. The focus will be on preparing the students with sufficient information, understanding and interpretation of biological data that may help them to learn of bioinformatics methodologies.

SECB3203 - Programming for Bioinformatics
This course provides students with the fundamental skills for programming in bioinformatics. It starts with introducing students to the command line environment in the Unix/Linux operating system. This will include a broad coverage of Unix/Linux utilities as well as shell scripting. This course will then use the Python programming language to illustrate the fundamentals of bioinformatics programming. Python-based data science tools will be used including NumPy, SciPy, Pandas and Jupyter Notebook. This course will focus on solving real world biological problems using bioinformatics algorithms and approaches.

SECB3213 - Bioinformatics Database
This subject introduces common types of biological data and major databases for bioinformatics applications. Students will learn how to search through the bioinformatics databases and the complete analytic process (data retrieval, pre-processing, data analysis and data visualization) for different types of biological data through different bioinformatics databases. Implementation of some of the process will be done in R programming.

SECB3133 - Computational Biology I
This course will discuss the basic topics of computational biology and the application in bioinformatics. Based on DNA Sequence Analyze Algorithm, the course will apply Python programming. Starts with the usage of basic Python in solving the DNA Sequence challenge,

student will learn how to build computational tools that are used to analyze biological data. At the end of this course, students will have an understanding and appreciation of how the computational biology solve the biological data challenge.

SECB3223 - Computational Biology II

This course presents a comprehensive introduction to machine learning algorithms in bioinformatics. It provides a solid understanding of the entire machine learning algorithms and the needs for it in bioinformatics. Students apply knowledge learnt to solve some real-world problem.

SECB4243 - Special Topics in Bioinformatics

A case-study approach to current topics in computational genomics. Completion of a series of projects emphasizing actual challenges facing by biologists and exposure to data science approach in life science. The projects are aimed in applying and developing current approaches that involve recent programming language such as Python and NodeJS with existing software packages.

SECB4213 - Bioinformatics Visualization

This course presents a comprehensive introduction to data visualization and data mining in Bioinformatics. Students will be exposed to various techniques in visualizing / mining biological data using R programming language. R provides a vibrant of packages that able to produce interactive visualization of the data. This also provides a solid understanding of the importance of visualization in Bioinformatics and students will also able to apply these techniques in solving real-world case studies in Bioinformatics.

SECB4313 - Bioinformatics Modeling and Simulation

This course introduces the concepts and applications of mathematical and computational modelling in Bioinformatics. Students are exposed to how to apply computational models and statistical methods on biological data to study and infer the underlying biological mechanisms and identify the common patterns.

SECB3104 - Applications Development

Pre-requisite : SECJ2203 Software Engineering, SECD2523 Database, SECV2223 Web Programming, SECJ2154 Object Oriented Programming

Application Development is a comprehensive service-learning course which requires student to solve a real community problem by developing an application. Students will learn how to practice design thinking, adopting Agile development methodology. This involves an iterative process starting from community engagement, requirement elicitation and analysis, design solution, application construction and iterative verification process. Students are required to do reflection on the outcome of the project. In this course students should be able to develop their soft skills such as leadership, team collaboration, documentation process and communication skill.

SECJ3553 - Artificial Intelligence
Pre-requisite: SECJ2013 Data Structure and Algorithm
This course offers students a new perspective on the study of Artificial Intelligence (AI) concepts. The essential topics and theory of AI are presented, but it also includes practical information on data input and reduction as well as data output (i.e. algorithm usage). In particular, this course emphasizes on theoretical and practical aspects of various search algorithms, knowledge representations, and machine learning methods. The course features practical implementations through assignments undertaken both individually and in groups

SEBB4173 - Cellular and Molecular Biology for Bioinformatics
This subject will facilitate students to understand and visualize processes in cell biology and those responsible for DNA transmission and expression hence mechanisms by which bacteria inherit genetic information as the blueprint of life. The lectures will explain relationship between structure and function in molecular biology and how this relationship operates to control biochemical processes. Topics include macromolecules like DNA, RNA and proteins and how processes like replication, transcription and translation operate, eukaryotic genetics. Students will cover related aspects such as mutation and mutagenesis, effects of mutation and how cells overcome mutation. Students will also learn about basic techniques in molecular biology as the basis for genetic engineering. Microsoft PowerPoint presentation by each group will be done at the end of the semester on designated topics.

SEBB4203 - Proteins Biomolecules
This course is a comprehensive introduction to the study of proteins and their importance to modern biochemistry. This course will start with a brief historical overview of the subject then move on to discuss the building blocks of proteins and their respective chemical and physical properties. This course will also explore experimental and computational methods of comparing proteins, methods of purification and protein folding and stability.

SEBB4193 - Gene and Protein Technology
Students will learn the fundamental concepts of genomics and proteomics. Lectures will cover the structure, function and evolution of the human genome. Strategies for large-scale sequencing projects. Bioinformatics for the analysis of sequence data; approaches for determining gene expression patterns and functions. Protein/peptide separation techniques, protein mass spectrometry, bioinformatics tools, and biological applications which include quantitative proteomics, protein modification proteomics, interaction proteomics, structural genomics and structural proteomics.

BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Computer Science (Software Engineering) with Honours is offered on a full-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fourteen (14) to eighteen (18) credit hours per semester. Assessment is based on coursework and final examinations given throughout the semester.

General Information

1. Awarding Institution	**Universiti Teknologi Malaysia**
2. Teaching Institution	Universiti Teknologi Malaysia
3. Programme Name	Bachelor of Computer Science (Software Engineering) with Honours
4. Final Award	Bachelor of Computer Science (Software Engineering) with Honours
5. Programme Code	SECJH
6. Professional or Statutory Body of Accreditation	Ministry of Higher Education
7. Language(s) of Instruction	English
8. Mode of Study (Conventional, distance learning, etc)	Conventional
9. Mode of operation (Franchise,self-govern, etc)	Self-governing
10. Study Scheme (Full Time/Part Time)	Full Time
11. Study Duration	Minimum : 4 yrs (8 semesters) Maximum : 6 yrs (12 Semesters)

Type of Semester	**No. of Semesters**		**No of Weeks/Semester**	
	Full Time	**Part Time**	**Full Time**	**Part Time**
Normal	8	20	14	14
Short	-	-	-	-

Course Classification

No	Classification	Credit Hours	Percentage
i.	University Courses a) General b) Language c) Co-Curriculum d) IT Entrepreneurship	 10 8 3 2	17.6%
ii.	Core Courses	74	56.5%
iii.	Elective Courses	34	25.9%
	Total	**131**	**100%**
A	Engineering Courses a) Lecture/Project/Laboratory b) Workshop/Field/Design Studio c) Industrial Training d) Final Year Project	Nil	Nil
Total Credit Hours for Part A			
B	Related Courses a) Applied Science/ Mathematic/ Computer b) Management/ Law/Humanities/ Ethics/ Economy c) Language d) Co-Curriculum	Nil	Nil
Total Credit Hours for Part B			
Total Credit Hours for Part A and B		**Nil**	
Total Credit Hours to Graduate		**131 credit hours**	

Award Requirements

To graduate, students must:

- Achieve a total of 131 credit hours with minimum CPA of 2.0
- Pass industrial training (equivalent to 12 credit hours), which 4 credits will be graded and 8 credits as HW (Compulsory Attendance) status.
- Complete Software Engineering Final Year Projects.
- Pass 5 Professional Skills Certificate (PSC).

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Obtain employment as software engineer in local and global industries and organization, where they are competent in applying the fundamental knowledge, computational principles and skills in Software Engineering to develop software of increasing size and complexity across different application areas.
PEO2	Demonstrate an ability to continue to learn throughout their career (i.e. professional, technical or postgraduate education) which can straighten their analytical and critical thinking skills to position them to advanced software engineering practice and to contribute to the intellectual foundations of the software engineering discipline.
PEO3	Involve with a number software project that they are proficient in applying appropriate methodologies, models and techniques that provide a basis for analysis, design, development, testing and implementation, evaluation, maintenance and documentation of a large-scale Software system.
PEO4	Becoming leaders or technopreneurs in software engineering discipline with combination skills.
PEO5	Demonstrate an awareness of professional ethics and social responsibility as software engineers.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Ability to acquire and apply knowledge of Computer Sciences and Software Engineering fundamentals.
PLO2	Ability to demonstrate comprehensive problem analysis and creative design skill to solve and manage complex computing problems using systematic and current approaches
PLO3	Ability to demonstrate technical and scientific expertise in a field of software engineering
PLO4	Ability to perform effective collaboration with stakeholders professionally
PLO5	Ability to communicate effectively both in written and spoken form with other professionals and community
PLO6	Ability to use digital technologies and software to support studies competently
PLO7	Ability to analyse numerical or graphical data using quantitative or qualitative tools in solving problems
PLO8	Ability to function individually or in teams, effectively, with a capability to be a leader.
PLO9	Ability to self-advancement through continuous academic or professional development
PLO10	Ability to initiate entrepreneurial project with relevant knowledge and expertise
PLO11	Ability to conduct respectable, ethical and professional practices in organization and society

COURSE MENU

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECI1013	Discrete Structure	3	
SECJ1013	Programming Technique I	3	
SECR1013	Digital Logic	3	
SECP1513	Technology & Information System	3	
UHMT1012	Graduate Success Attributes	2	
Malaysian Students			
UHIS1022	Falsafah dan Isu Semasa	2	
UHMS1182	Penghayatan Etika dan Peradaban	2	
International Students			
UHLB2122	Academic Communication Skills	2	
UHIT2302	The Thought of Sciences and Technology	2	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**18**	
** Students must apply for UHLB1122 credit exemption from semester 1 (if you are qualified).* *Only students with the following previous qualification can apply for credit exemption: Minimum score of IELTS Band 5.5 or TOEFL 525 or TOEFL iBT 60 or CEFR B2 or MUET Band 4 {Malaysian student)*			

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECI1113	Computational Mathematics	3	
SECI1143	Probability & Statistical Data Analysis	3	
SECJ1023	Programming Technique II	3	SECJ1013
SECR1033	Computer Organisation and Architecture	3	SECR1013
UHLB1122*	English Communication Skills	2	
Malaysian Students			
UHIT2302	The Thought of Sciences and Technology		
International Students			
UHLM1012	Malaysia Language for Communication	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**34**	
**For students who have applied your UHLB1122 exemption in SEMESTER 1 and if your application has been approved you do not have to register for UHLB1122 this semester. Your 2 credits exemption will be shown in your transfer credit slip. Students who have received UHLB1122 credit exemption also can register for another 2 credits course determined by the academic office.*			

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECD2523	Database	3	
SECD2613	System Analysis and Design	3	
SECJ2013	Data Structure and Algorithm	3	SECJ1023
SECR2213	Network Communications	3	
SECV2113	Human Computer Interaction	3	
UKQF2xx2	Service-Learning Co-curriculum Elective	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**51**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECJ2203	Software Engineering	3	
SECV2223	Web Programming	3	
SECR2043	Operating Systems	3	
SECJ2154	Object Oriented Programming	4	SECJ1023
Elective Courses - Choose 1 (3 Credits)			
SECJ2253	Requirements Engineering & Software Modelling	3	SECJ2203
SECJ2363	Software Project Management	3	
Malaysian Students			
UHLB2122	Academic Communication Skills	2	
International Students			
UHIS1022	Falsafah dan Isu Semasa	2	
UHMS1182	Penghayatan Etika dan Peradaban		
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**69**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
UHLB3132	Professional Communication Skills	2	
UHLx1122	Foreign Language Elective	2	
UKQE3001	Extracurricular Experiential Learning	1	
Elective Courses - Choose 4 (13 Credits)			
SECJ3104	Applications Development	4	SECJ2203, SECD2523, SECV2223, SECJ2154
SECJ3553	Artificial Intelligence	3	SECJ2013
SECJ3303	Internet Programming	3	SECJ2154, SECV2223
SECJ3323	Software Design & Architecture	3	SECJ2203
SECJ3603	Knowledge-Based & Expert Systems	3	SECJ3533

	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**87**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECJ3032	Software Engineering Project I	2	80 credits SECJ3104
SECJ3203	Theory of Computer Science	3	SECI1013 SECJ2013
Elective Courses - Choose 4 (12 Credits)			
SECJ3343	Software Quality Assurance	3	SECJ2203
SECJ3563	Computational Intelligence	3	SECJ3553
SECJ 3623	Mobile Application Programming	3	SECJ2154
SECJ3403	Special Topic in Software Engineering	3	
SECJ3483	Web Technology	3	SECJ2154 SECV2223
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**104**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECJ4118	Industrial Training (HW)	8	92 credits CGPA >= 2.0
SECJ4114	Industrial Training Report	4	
	TOTAL CREDIT	**12**	
	CUMULATIVE CREDITS	**116**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECJ4134	Software Engineering Project II	4	SECJ3032
SECD3761	Technopreneurship Seminar	1	
UBSS1032	Introduction to Entrepreneurship	2	
UXXX 2xx2	Enrichment of Knowledge Elective	2	
UXXX2XX2	Generic Skill Elective		
Elective Courses - Choose 2 (6 Credits)			
SECJ4383	Software Construction	3	SECJ2203
SECJ4423	Real-Time Software Engineering	3	SECJ2203
SECJ4463	Agent-Oriented Software Engineering	3	SECJ2203 SECJ2154
SECP5xx3/ SECJ5xx3/ SECR5xx3	PRISMS Elective 1	3	
SECP5xx3/ SECJ5xx3/ SECR5xx3	PRISMS Elective 2	3	

	TOTAL CREDIT	**15**	
	CUMULATIVE CREDITS	**131**	

PRISMS ELECTIVE COURSES

For students who intended to enrol in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.The PRISMS elective begins with code SECP/J/R5XX3.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
COMPUTER SCIENCE COURSES					
CORE COURSES (74 CREDITS)					
1	SECI1013	Discrete Structure	3	3	
2	SECJ1013	Programming Technique I	3	3	
3	SECR1013	Digital Logic	3	3	
4	SECP1513	Technology & Information System	3	3	
5	SECI1113	Computational Mathematics	3	3	
6	SECl1143	Probability & Statistical Data Analysis	3	3	
7	SECJ1023	Programming Technique II	3	3	
8	SECR1033	Computer Organisation and Architecture	3	3	
9	SECD2523	Database	3	3	
10	SECD2613	System Analysis and Design	3	3	
11	SECJ2013	Data Structure and Algorithm	3	3	
12	SECR2213	Network Communications	3	3	
13	SECV2113	Human Computer Interaction	3	3	
14	SECJ2203	Software Engineering	3	3	
15	SECV2223	Web Programming	3	3	
16	SECR2043	Operating Systems	3	3	
17	SECJ2154	Object Oriented Programming	4	4	
18	SECJ3032	Software Engineering Project I	2	2	
19	SECJ3203	Theory of Computer Science	3	3	
20	SECJ4118	Industrial Training	8	HL	
21	SECJ4114	Industrial Training Report	4	4	
22	SECJ4134	Software Engineering Project II	4	4	
23	SECD3761	Technopreneurship Seminar	1	1	

ELECTIVES COURSES (34 CREDITS) – Choose SECJ3104 and 10 other elective courses from the following list (which can include up to maximum of 4 PRISMS courses, for qualified students)					
SECJ ELECTIVES COURSES					
24	SECJ2253	Requirements Engineering & Software Modelling	3	3	
25	SECJ2363	Software Project Management	3	3	
26	SECJ3104	Applications Development	4	4	
27	SECJ3553	Artificial Intelligence	3	3	
28	SECJ3303	Internet Programming	3	3	
29	SECJ3323	Software Design & Architecture	3	3	
30	SECJ3603	Knowledge-Based & Expert Systems	3	3	
31	SECJ3343	Software Quality Assurance	3	3	
32	SECJ3563	Computational Intelligence	3	3	
33	SECJ3623	Mobile Application Programming	3	3	
34	SECJ3403	Special Topic in Software Engineering	3	3	
35	SECJ3483	Web Technology	3	3	
36	SECJ4383	Software Construction	3	3	
37	SECJ4423	Real-Time Software Engineering	3	3	
38	SECJ4463	Agent-Oriented Software Engineering	3	3	
PRISMS ELECTIVES COURSES					
39	SECR5033	Information Security Governance and Risk Management	3	3	
40	SECR5043	Cloud Computing Security	3	3	
41	SECJ5013	Secure Software Engineering	3	3	
42	SECR5053	Penetration Testing	3	3	
43	SECJ5023	Advanced Theory of Computer Science	3	3	
44	SECJ5033	Advanced Data Structure and Algorithms	3	3	
45	SECJ5043	Advanced Artificial Intelligence	3	3	
46	SECP5013	Advanced Analytics for Data Science	3	3	
47	SECP5023	Big Data Management	3	3	
48	SECP5033	Business Intelligence and Analytics	3	3	
49	SECP5043	Data Science Governance	3	3	
50	SECP5053	Massive Mining and Streaming	3	3	
51	SECP5063	Statistics for Data Science	3	3	
TOTAL CREDIT OF COMPUTER SCIENCE COURSES (a)			**108**	**100**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
For Malaysian Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	
2	UHMS1182	Penghayatan Etika dan Peradaban	2	2	
For International Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	

	UHMS1182	Penghayatan Etika dan Peradaban			
2	UHLM1012	Malaysia Language for Communication	2	2	
Cluster 2: Generic Skills					
1	UBSS1032	Introduction to Entrepreneurship	2	2	
2	UHMT1012	Graduate Success Attributes	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQF2xx2	Service-Learning Co-curriculum Elective	2	2	
2	UKQT3001	Extracurricular Experiential Learning	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB1122	English Communication Skills	2	2	
2	UHLB2122	Academic Communication Skills	2	2	
3	UHLB3132	Professional Communication Skills	2	2	
4	UHLx1112	Foreign Language Elective	2	2	
Other University Electives					
1	Uxxx2xx2	Any 1 course from Cluster 2 or Cluster 3	2	2	
TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)			23	23	
TOTAL CREDIT TO GRADUATE (a + b + c)			131	123	

OTHER COMPULSORY COURSES		
No.	**PSC COURSE**	
COMPULSORY COURSES		
1.	Design Thinking for Entrepreneur	
2.	Talent and Competency Management	
3.	English Communication Skills for Graduating Students (ECS)	
ELECTIVE COURSES		
4.	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	

COURSE SYNOPSIS

CORE COURSES

SECI1013 - Discrete Structure

This course introduces students to the principles and applications of discrete structure in the field of computer science. The topics that are covered in this course are set theory, proof techniques, relations, functions, recurrence relations, counting methods, graph theory, trees and finite automata. At the end of the course, the students should be able to use set theory, relations and functions to solve computer science problems, analyze and solve problems using recurrence relations and counting methods, apply graph theory and trees in real world problems and use deterministic finite automata finite state machines to model electronic devices and problems.

SECJ1013 - Programming Technique I

As a fundamental subject, this course equips the students with theory and practice on problem solving techniques by using the structured approach. Students are required to develop programs using C++ programming language, in order to solve simple to moderate problems. The course covers the following: pre-processor directives, constants and variables, data types, input and output statements, control structures: sequential, selection and loop, built-in and user-defined functions, single and two-dimensional arrays, file operations, pointers, and structured data types.

SECR1013 - Digital Logic

Digital electronics is the foundation of all microprocessor-based systems found in computers, robots, automobiles, and industrial control systems. This course introduces the students to digital electronics and provides a broad overview of many important concepts, components, and tools. Students will get up-to-date coverage of digital fundamentals-from basic concepts to programmable logic devices. Laboratory experiments provide hands-on experience with the simulator software, actual devices and circuits studied in the classroom.

SECP1513 - Technology & Information System

As a primer subject, this course will introduce students to information systems and technology (IS/IT), as well as its uses in daily life both at home and at work. Various aspects of IS/IT encompassing hardware, software, network, communications, internet, multimedia, graphics and systems applications will be introduced. Students will be equipped with basic skills in handling PC installation and productivity tools via practical work in the labs, which shall comprise a major part of the study. At the end of the course, student should be able to distinguish basic IS/IT component and applications.

SECI1113 - Computational Mathematics

This course is a combination of linear algebra and numerical methods as preparation for computer science student to apply mathematics knowledge in core knowledge of computer science. The first part of this course is an introduction to linear algebra. The topics that are covered in linear algebra are linear equations, linear combinations, linear independence, linear transformation, and vector spaces. The second part of this course covers numerical

methods that can be used to solve non-linear equation, linear systems, eigenvalue problems, interpolation, differentiation and integration. At the end of the course, students should be able to apply mathematics knowledge to solve mathematical problems. Implementation of engineering tools such as MATLAB, would enhance student to use simple programming technique for solving mathematical problems.

SECl1143 - Probability & Statistical Data Analysis

This course is designed to introduce some statistical techniques as tools to analyse the data. In the beginning the students will be exposed with various forms of data. The data represented by the different types of variables are derived from different sources; daily and industrial activities. The analysis begins with the data representation visually. The course will also explore some methods of parameter estimation from different distributions. Further data analysis is conducted by introducing the hypothesis testing. Some models are employed to fit groups of data. At the end of course the students should be able to apply some statistical models in analysing data using available software.

SECJ1023 - Programming Technique II

Pre-requisite : SECJ1013 Programming Technique I

This course presents the concept of object orientation and object-oriented programming (OOP) techniques using the C++ programming language. It equips the students with the theory and practice on problem solving techniques using the object oriented approach. It emphasizes on the implementation of the OOP concepts including encapsulations, associations and inheritance. At the end of this course, students should be able to apply the OOP techniques to solve problems.

SECR1033 - Computer Organisation and Architecture

Pre-requisite : SECR1013 Digital Logic

This course was designed to give the understanding of basic concept of computer organization and architecture. Topics covered in this subject will be on computer performance, types of data and the representative, arithmetic manipulation, instruction execution, micro programmable control memory, pipelining, memory, input/output and instruction format. At the end of this course, the student should be able to understand the concept of overall computer component and realize the current technology in computer hardware.

SECD2523 - Database

This course introduces students to the concept of database system and how it is used in daily human life and profession. The focus of the course is to equip students with the knowledge and skills on important steps and techniques used in developing a database, especially in the conceptual and logical database design phase. Among topics covered are database environment, database design, entity relationship diagram, normalization, and structured query language (SQL). Students will be taught to use a database management system (DBMS). Students are required to design and develop the database component of an information system using the learned techniques, DBMS and a development tool. At the end of the course, students should be able to apply the knowledge of designing and developing a good database system.

SECD2613 - System Analysis and Design

The main focus of this course is to provide a practical approach of systems analysis and designing skills for the students using structured methodology. Hence the course enables students to study information system requirements for any system application within an organizational context. The contents are sequentially organized directly from planning, analysis, designing and implementation phases. From the resulting output of the planning and analysis phase shall enable students to form input, output and interface design. Hence a prototype design can be demonstrated.

SECJ2013 - Data Structure and Algorithm

Pre-requisite : SECJ1023 Programming Technique II

This course emphasis on data structure concepts theoretically and practically with detail algorithms for each of data structure. Students will learn abstract data type concepts using class and apply the concept in the implementation of data structures. Apart from it, student will learn recursive concept as a programming style and algorithm efficiency analysis with Big O notation. Various sorting and searching techniques will be discussed as data structure operations. Analysis of each algorithm will also be explained. Further, students will be exposed to linear data structures such as linked lists, stack and queue. Non-linear data structures such as tree and binary search tree will be discussed. Along the course, students should be able to implement and apply the theory and concepts of data structure in the assignments and mini project which are conducted in group.

SECR2213 - Network Communications

This course will discuss the basic topics of computer network and data communications. Based on TCP/IP Internet protocol stack, the course will apply top down approach. Starts with the important and usage of computer network in commonly applications, the approach will go further detail in the technical aspect in data communication. At the end of this course, students will have an understanding and appreciation of how the network works.

SECV2113 - Human Computer Interaction

This course will introduce students to human-computer interaction theories and design processes. The emphasis will be on applied user experience (UX) design. The course will present an iterative evaluation-centered UX lifecycle and will introduce a broader notion of user experience, including usability, usefulness, and emotional impact. The lifecycle should be viewed as template intended to be instantiated in many different ways to match the constraints of a particular development project. The UX lifecycle activities we will cover include contextual inquiry and analysis, requirements extraction, design-informing models, design thinking, ideation, sketching, conceptual design, and formative evaluation.

SECJ2203 - Software Engineering

This course is designed to give students an introduction to an engineering approach in the development of high-quality software systems. It will discuss the important software engineering concepts in the various types of the common software process models. The students will also learn the concepts and techniques used in each software development phase including requirements engineering, software design and software testing. This course will also expose the students to utilizing object-oriented method (e.g. UML) and tools in

analyzing and designing the software. At the end of this course, students are expected to be able to appreciate most of the common software engineering concepts and techniques as well as producing various software artifacts, documentations, and deliverables.

SECV2223 - Web Programming

This course is designed to introduce students the fundamental of knowledge, technologies and components for web application developments. The basic topics includes the standard HTML for content creation, CSS for content presentation, JavaScript for client-side logics, PHP for server-side logics and MySQL for database processing. At the end of the course, the students should be able to apply the web base technologies and then implement it all in the creating functional data-centric online system project.

SECR2043 - Operating Systems

Pre-requisite : SECR1033 Computer Organization and Architecture

This course covers introduction to operating systems, which serve as an interface between computer hardware and the user. The operating system is responsible for the management and coordination of processes, sharing of limited resources of the computer. Students will be exposed to the techniques and algorithms that may be applied in designing an operating system. Topics covered include process management, concurrency and synchronization, deadlock, memory management, file management, secondary storage management and I/O management. At the end of the course, the student shall have a clear understanding on the general concepts that underlie of an operating system.

SECJ2154 - Object Oriented Programming

Pre-requisite : SECJ1023 Programming Technique II

This course presents the concepts of object orientation and object-oriented programming techniques using Java programming language. It provides students with a thorough look at the basic constructs of the Java programming language such as its basic data types and operations. It also emphasizes on the use of standard Java APIs that allow students to develop text-based and GUI applications. It will also provide the programming techniques on exception handling and input/output files. At the end of this course, students should be able to use the basic constructs in object-oriented programming and utilize the selected Java APIs.

SECJ3032 - Software Engineering Project I

Pre-requisite : 80 credits AND SECJ3104 Application Development

This is the initial part of a 2-part Final Year Project that every student must fulfil successfully. Students are introduced to the methodologies of research and application development through a series of lectures. Students are guided through a step-by-step practice to complete the initial stages of proposal, planning and design of a project. Students must also meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their initial work.

SECJ3203 - Theory of Computer Science
Pre-requisite: SECI1013 Discrete Structure
SECJ2013 Data Structure and Algorithm

The goal of this course is to provide students with an understanding of basic concepts in the theory of computation. This course introduces students to formal languages and automata theory. It will emphasize on languages, grammars and abstract machines i.e. Regular Language, Context Free Language, Regular Grammar, Context Free Grammar, Finite Automata, Push Down Automata and Turing Machine. The course will also provide practice on the acceptability of input string by these machines. At the end of the course, students should be able to apply the theory in constructing these abstract machines and testing them with the right input strings.

SECJ4118 - Industrial Training (HW)
Pre-requisite: 92 credits AND CGPA >= 2.0

Industrial Training refers to the placement of a student at an organization for a minimum of 20 weeks to elevate students' knowledge and skills in a specific database profession and at the same time produce graduates who are credible, creative and proficient. This course aims to provide a platform for the students apply their knowledge learned in the university and boost their skills which needed by a profession. It is also intend for the students to gain exposure in every aspect of real career life. The students will be evaluated based on two components; 1) student performance evaluation by organisation supervisor and 2) student performance evaluation by faculty supervisor. The organization supervisor is expected to assess the student performance based on work performance and students personality. The assessment by faculty supervisor more focusing on students' generic skills.

SECJ4114 - Industrial Training Report
Pre-requisite : 92 credits AND CGPA >= 2.0

Industrial Training Report refers to the placement of a student at an organization for a minimum of 20 weeks to experience and apply their theoretical knowledge in the industrial training. The students will be evaluated based on four components; 1) technical report, 2) oral presentation, 3) log book and 4) ethics. The aim of the technical report is to educate the students in producing related technical report and able to explain a specific detail on the tasks that have been done during the training. Students need to follow specified format in writing the technical report and submit it within the predetermined date. The students are required to present their training achievement to Industrial Training supervisors (organization and supervisor). Students need to fill in the online log book daily for the purpose of close monitoring between the students and supervisors. Student also needs to practice the good ethical values and work conduct throughout the training. The passing mark is 60%.

SECJ4134 - Software Engineering Project II
Pre-requisite : SECJ3032 Software Engineering Project I

This is the second part of a 2-part Final Year Project that every student must fulfil successfully. In this installation, students are required to execute the next phases of their development plan from Part1. Students are now required to code and integrate the different modules that make up the proposed project. Students will test the developed modules and the final fully-integrated project following software development and research testing

practices. Students must meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their final work.

SECD3761 - Technopreneurship Seminar
This 1-credit course will provide module and training for students on how to generate digital income through crowdsourcing platforms and methods. Crowdsourcing is a method to generate online income which the work is offered and implemented digitally in global platforms.

ELECTIVE COURSES

SECJ2253 - Requirements Engineering & Software Modelling
Pre-requisite : SECJ2203 Software Engineering
This course provides an introduction to requirement engineering and a thorough look at the software modeling. It will include requirements engineering topics include types of requirements, requirements elicitation techniques, requirements specification: text-based and model-based, requirements validation and negotiation, as well as requirements management. At the end of this course, the students shall have the skills necessary to conduct requirements engineering process with appropriate principles and methods.

SECJ2363 - Software Project Management
This course is designed to provide students with in-depth knowledge on software project planning, cost estimation and scheduling, project management tools, factors influencing productivity and success, productivity metrics, analysis of options and risks, software process improvement, software contracts and intelectual property and approaches to maintenance and long term software development. At the end of this course, students should be able to know how to manage a software development lifecycle.

SECJ3104 - Applications Development
Pre-requisite : SECJ2203 Software Engineering, SECD2523 Database, SECV2223 Web Programming, SECJ2154 Object Oriented Programming
Application Development is a comprehensive service learning course which requires student to solve a real community problem by developing an application. Students will learn how to practice design thinking, adopting Agile development methodology. This involves an iterative process starting from community engagement, requirement elicitation and analysis, design solution, application construction and iterative verification process. Students are required to do reflection on the outcome of the project. In this course students should be able to develop their soft skills such as leadership, team collaboration, documentation process and communication skill.

SECJ3553 - Artificial Intelligence
Pre-requisite : SECJ2013 Data Structure and Algorithm
This course offers students a new perspective on the study of Artificial Intelligence (AI) concepts. The essential topics and theory of AI are presented, but it also includes practical information on data input and reduction as well as data output (i.e. algorithm usage). In particular, this course emphasizes on theoretical and practical aspects of various search

algorithms, knowledge representations, and machine learning methods. The course features practical implementations through assignments undertaken both individually and in groups.

SECJ3303 - Internet Programming
Pre-requisite : SECJ2154 Object Oriented Programming
SECV2223 Web Programming

This course covers the development of web component with Servlets and Java Server Pages (JSP) Technologies. This course will enable students to obtain the knowledge and skills necessary to quickly build web applications based on Servlet and JSP technologies using the NetBeans IDE and Glassfish/Tomcat web container. Students are exposed to the current methods for analyzing, designing, developing, and deploying web applications with Java technologies. At the end of this course, student should be able to develop a web-based application using Servlet, JSP and JavaBeans technologies.

SECJ3323 - Software Design & Architecture
Pre-requisite : SECJ2203 Software Engineering

This course provides the students with an in-depth look at the theory and practice of software architecture and design. It introduces the important concepts related to software architecture and design. It emphasizes on the design and (faithful) implementation of a large scale software using the widely accepted architecture styles and design patterns. It will also expose students to the use of the industrial strength design notations (e.g. UML) and CASE tools (e.g. Ent Arch, Visual Studio). In addition, it provides other aspects of a large and complex software design such as user interface design, management, leadership, and ethics. At the end of this course, the students should be able to use the techniques, architectural styles, and design patterns in software design.

SECJ3603 - Knowledge-Based & Expert Systems
Pre-requisite : SECJ3533 Artificial Intelligence

This course is designed to expose the students to knowledge-based system that requires expert knowledge in the system development. It emphasizes the theory, concepts and important components in expert system. The students will be introduced the difference between expert system and conventional systems. Students will be experience developing an application using any expert system tools with appropriate methodologies. Having some skill in AI programming, but not essential, is an advantage in the development of the system prototype. The students are expected to be able to work in a team and adhere to professional ethics.

SECJ3343 - Software Quality Assurance

The content of the course discusses the Software Quality issues much beyond the classic boundaries of custom-made software development by large established software houses. It dedicates significant attention to the other software development and maintenance environment that reflect the current state of industry. This course is designed to provide students with in depth knowledge on software testing and its test process. The course covers the basic principles of software testing and test activities that include the test plan, test design, monitoring, implementation and test closure. The students will also learn various categories of test design techniques and methods used in both black-box and white-box

testing. At the end of this course, students should be able to recognize various types and levels of testing as well as categorizing and applying software testing process and techniques.

SECJ3563 - Computational Intelligence
Pre-requisite : SECJ3553 Artificial Intelligence
The aim of this course is to expose the students to current methods and algorithms utilized in area of computational intelligence. The methods include knowledge representation of vague data and inferences using fuzzy logic, learning using neural network and searching using evolutionary algorithms. Students will be equipped with the theories and the necessary skills to model the domain problems suited to the associated techniques or algorithms. This course will cover the topics on fuzzy logic, neural network and evolutionary algorithms. Hands-on class on how to apply the techniques in solving non-linear problems is also introduced. Conducting a paper review of related journals will expose the students to appreciate the contributions of CI-related techniques in solving real-world problems besides developing academic research writing skill.

SECJ3623 - Mobile Application Programming
Pre-requisite : SECJ2154 Object-Oriented Programming
This course is concerned with the development of application for mobile and wireless handheld devices such as personal digital assistants (PDA) and mobile phones. These mobile applications are either native/installation-based, or web applications delivered over HTTP. In this course, the emphasis is placed on the processes, tools and frameworks required to develop applications for current and emerging mobile computing devices. A current and dominant technology will be selected as a basis for teaching programming techniques and design patterns related to the development of these standalone applications and mobile portals to enterprise and m-commerce systems. Students will work at all stages of the software development life-cycle from inception through to implementation and testing. In doing so, students will be required to consider the impact of user characteristics, device capabilities, networking infrastructure and deployment environment, in order to develop software for the targeted mobile environment.

SECJ3403 - Special Topic in Software Engineering
This course provides students with current issues related to software engineering in general and specifically in software development life cycle that includes planning, analysis, design, implementation, and maintenance. The key objective of this course is to equip the students with the knowledge in current issues mainly the research done to solve related problems. Based on the given topic in current research, the students should argue and think critically what could be other alternatives besides the current solutions.

SECJ3483 - Web Technology
Pre-requisite : SECJ2154 Object Oriented Programming
SECV2223 Web Programming
The content of the course is divided into 2 main parts. The first is on the state of the art of web technology (Web2.0 and Web3.0). The student will be introduced to various topics such as web services, frontend web application, world wide web data (JSON), mobile technologies, social network, collaborative content management and semantic web. The

second part is on the technologies/API and actual development on the next evolution of web application - the frontend web application. The students will be introduced to various related APIs and technologies for the development of frontend web and hybrid mobile application. Javascript as the main development language. jQuery as the library for managing frontend view. Bootstrap and framework7 for responsive CSS. AJAX and JSON for communicating and data transfer to the backend. PHP Slim framework for the RESTFul backend API development. Finally, Phonegap/Cordova as compiler for compiling Javascript frontend web application into hybrid mobile app.

SECJ4383 - Software Construction
Pre-requisite : SECJ2203 Software Engineering
This course provides students with two main phases in software development life cycle that are software construction and evolution. The knowledge subareas for software construction include software construction fundamentals, managing construction, practical considerations. In addition, the knowledge subareas for software evolution or maintenance include software maintenance fundamentals, key issues in software maintenance, maintenance process, and techniques for software maintenance. The key objective of this course is to equip the students with the skills to manage software construction towards maintainable software that is easy to maintain in future.

SECJ4423 - Real-Time Software Engineering
Pre-requisite : SECJ2203 Software Engineering
This course equips the students with knowledge in embedded real-time systems and real-time software development particularly on how software engineering approaches assist real-time software development. The knowledge unit for this course area emphasize the following topics; real-time concepts, embedded real-time development methodologies, real-time operating systems, embedded real-time hardware fundamental and real-time analysis. The objective of this course is to introduce students with key software engineering practices in real-time software development and give practical experience to the students in developing embedded real-time software using appropriate software methods and tools.

SECJ4463 - Agent-Oriented Software Engineering
Pre-requisite : SECJ 2203 Software Engineering
SECJ2154 Object Oriented Programming
The course begins with an overview of the software agent multiagent system (MAS). Then we focus on agent system architecture and infrastructure from a software engineering viewpoint, including requirements for agent-based systems, modeling and design of agent-based systems, development process for agent-based systems. Topics such as agent architecture, agent communication language and knowledge sharing, agent coordination and belief desire intention for agent modelling are discussed. Java Agent Development Framework (JADE) is used for development and will be in line with the material presented. GAIA will be used as framework for the design of the MAS requirement specification. For managing knowledge for the agent, Java rule agent (JSR94) will be introduced.

BACHELOR OF COMPUTER SCIENCE (DATA ENGINEERING) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Computer Science (Data Engineering) with Honours is offered on a full-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fourteen (14) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Computer Science (Data Engineering) with Honours	
4. Final Award			Bachelor of Computer Science (Data Engineering) with Honours	
5. Programme Code			SECPH	
6. Professional or Statutory Body of Accreditation			Ministry of Higher Education	
7. Language(s) of Instruction			English	
8. Mode of Study (Conventional, distance learning, etc)			2u2i	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum : 4 yrs (8 semesters) Maximum : 6 yrs (12 Semesters)	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	20	14	14
Short	-	-	-	-

Course Classification

No	Classification	Credit Hours	Percentage
i.	University Courses a) General b) Language c) Co-Curriculum d) IT Entrepreneurship	 10 8 3 2	17.6%
ii.	Core Courses	77	58.7%
iii.	Elective Courses	31	23.7%
	Total	**131**	**100%**
A	Engineering Courses a) Lecture/Project/Laboratory b) Workshop/Field/Design Studio c) Industrial Training d) Final Year Project	Nil	Nil
Total Credit Hours for Part A		**Nil**	
B	Related Courses a) Applied Science/Mathematic/ Computer b) Management/Law/Humanities/ Ethics/Economy c) Language d) Co-Curriculum	Nil	Nil
Total Credit Hours for Part B		**Nil**	
Total Credit Hours for Part A and B		**Nil**	
Total Credit Hours to Graduate		**131 credit hours**	

Award Requirements

To graduate students MUST:

- Achieve a total of 131 credit hours with minimum CPA of 2.0;
- Pass both industrial training component and final year project component at the industry (equivalent to 26 credit hours in two consecutive semesters in Year 4), where:
  - 14 credits will be graded at the first semester under the Professional Development and Practice course codes SECP4114, SECP4124, SECP4134 and SECP4112; and
  - 12 credits will be graded at the second semester under the Industrial Integrated Project course codes SECP4223, SECP4235 and SECP4234.
- Pass 5 Professional Skills Certificate (PSC).

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	To produce graduates who are able to obtain employment as computer scientist in local and global industries and organization, where they are competent in applying the fundamental knowledge, computational principles and skills in data engineering and computer science to develop software of increasing size and complexity across different application areas
PEO2	To produce graduates who are able to demonstrate an ability to continue to learn throughout their career (i.e., professional, technical or postgraduate education) which can strengthen their analytical and critical thinking skills to position them to advanced computer science practice and data engineering to contribute to the intellectual foundations of the computer science discipline
PEO3	To produce graduates who are capable to involve with a number of software and data engineering projects that they are proficient in applying theoretical computing and knowledge in analyzing, modelling, designing, developing and evaluating computing solutions.
PEO4	To produce graduates who are able to becoming leaders or technopreneurs in computer science discipline
PEO5	To produce graduates who are able to demonstrate an awareness of professional ethics and social responsibility as computer scientist.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Ability to acquire the theory and principles of Computer Science and Data Engineering and be equipped with social science and personal development knowledge.
PLO2	Critically solve and manage complex problems using systematic approaches.
PLO3	Adapt technical and scientific skills to solve problems in a field of Data Engineering
PLO4	Demonstrate effective collaboration with stakeholders professionally.
PLO5	Use a broad range of information, media and technology to support study.
PLO6	Competently use digital technologies and software to support research works or studies.
PLO7	Analyse numerical and graphical data using quantitative or qualitative tools in solving problems.
PLO8	Demonstrate leadership, autonomy and responsibility in conducting and managing research and resources.
PLO9	Self-advancement through continuous academic or professional development.
PLO10	Initiate entrepreneurial project with relevant knowledge and expertise.
PLO11	Demonstrate respectable ethical conducts and professionalism skills in an organization and society.

COURSE MENU

YEAR 1: SEMESTER 1				
	CODE	**COURSE NAME**	**CREDIT**	**PRE-REQUSITE**
	SECP1513	Technology and Information Systems (WBL)	3	
	SECJ1013	Programming Technique I	3	
	SECR1013	Digital Logic	3	
	SECI1013	Discrete Structure	3	
	UHMT1012	Graduate Success Attribute	2	
	Local Students			
	UHIS1022	Philosophy and Current Issues	2	
	UHMS1182	Appreciation of Ethics and Civilizations	2	
	International Students			
	UHMS1182	Appreciation of Ethics and Civilizations	2	
	UHLM1012	Malaysia Language for Communication 2	2	
TOTAL CREDIT			**18**	
CUMULATIVE CREDIT			**18**	

YEAR1: SEMESTER 2				
	CODE	**COURSE NAME**	**CREDIT**	**PRE-REQUSITE**
	SECJ1023	Programming Technique II	3	SECJ1013
	SECV2113	Human Computer Interaction	3	
	SECI1143	Probability & Statistical Data Analysis	3	
	SECR1033	Computer Organization and Architecture	3	SECR1013
	UHIT2302	Science and Technology Thinking	2	
	UHLB1112	English Communication Skills	2	
	UKQF2*xx*2	*Co-Curriculum Service Learning*	2	
TOTAL CREDIT			**18**	
CUMULATIVE CREDIT			**36**	

YEAR 2: SEMESTER 1				
	CODE	**COURSE NAME**	**CREDIT**	**PRE-REQUSITE**
	SECP2523	Database *(WBL)	3	
	SECP2613	System Analysis and Design *(WBL)	3	
	SECJ2013	Data Structure and Algorithm	3	SECJ1023
	SECR2213	Network Communication	3	
	UHLB2122	Academic Communication Skills	2	
	Elective Courses – Choose 1 (3 credits)			
	SECP3723	System Development Technology (WBL)	3	
	SECP2733	Multimedia Data Modeling (WBL)	3	
TOTAL CREDIT			**17**	
CUMULATIVE CREDIT			**53**	

YEAR 2: SEMESTER 2				
	CODE	**COURSE NAME**	**CREDIT**	**PRE-REQUSITE**
	SECJ2154	Object-Oriented Programming	4	SECJ1023
	SECR2043	Operating System	3	SECR1033
	SECD3761	Technopreneurship Seminar	1	
	UBSS1032	Introduction to Entrepreneurship	2	
	UHLB3132	Professional Communication Skills	2	
	UXXX2xx2	*Generic Skills Elective* OR *Knowledge Enhancement Elective*	2	
	Elective Courses – Choose 1 (3 credits)			
	SECP2633	Information Retrieval	3	
	SECP2753	Data Mining	3	
TOTAL CREDIT			**17**	
CUMULATIVE CREDIT			**70**	

YEAR 3: SEMESTER 1				
	CODE	**COURSE NAME**	**CREDIT**	**PRE-REQUSITE**
	SECJ3553	Artificial Intelligence	3	
	UHL*X*1112	*Elective Foreign Language*	2	
	UKQT3001	Extra-Curricular Experiential Learning	1	
	Elective Courses – Choose 4 (12 credits)			
	SECP3133	High Performance Data Processing	3	
	SECP3213	Business Intelligence	3	
	SECP3623	Database Programming	3	
	SECP3713	Database Administration	3	
	SECP3223	Data Analytic Programming	3	
TOTAL CREDIT			**18**	
CUMULATIVE CREDIT			**88**	

YEAR 3: SEMESTER 2				
	CODE	**COURSE NAME**	**CREDIT**	**PRE-REQUSITE**
	SECP3204	Software Engineering *(WBL)	4	
	Elective Courses – Choose 3 (13 credits)			
	SECP3744	Enterprise Systems Design and Modeling*(WBL)	4	
	SECP3843	Special Topic in Data Engineering *(WBL)	3	
	SECP3823	Knowledge Management Systems *(WBL)		
	SECP3106	Application Development *(WBL)	6	
	SECP3416	Management Information Systems *(WBL)		

TOTAL CREDIT	**17**	
CUMULATIVE CREDIT	**105**	

YEAR 4: SEMESTER 1 (Conducted during internship at selected industry)				
	CODE	**COURSE NAME**	**CREDIT**	**PRE-REQUSITE**
	SECP4114	Professional Development	4	
	SECP4124	Professional Practice	4	
	SECP4134	Professional Development and Practice Report	4	
	SECP4112	Initial Industry Project Proposal	2	
TOTAL CREDIT			**14**	
CUMULATIVE CREDIT			**119**	

YEAR 4: SEMESTER 2 (Conducted during internship at selected industry)				
	CODE	**COURSE NAME**	**CREDIT**	**PRE-REQUSITE**
	SECP4223	Industrial Integrated Project Proposal	3	
	SECP4235	Industrial Integrated Project Development	5	
	SECP4234	Industrial Integrated Project Report	4	
TOTAL CREDIT			**12**	
CUMULATIVE CREDIT			**131**	

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
COMPUTER SCIENCE COURSES					
CORE COURSES (77 CREDITS)					
1	SECP1513	Technology and Information Systems (WBL)	3	3	
2	SECJ1013	Programming Technique I	3	3	
3	SECR1013	Digital Logic	3	3	
4	SECI1013	Discrete Structure	3	3	
5	SECJ1023	Programming Technique II	3	3	
6	SECV2113	Human Computer Interaction	3	3	
7	SECI1143	Probability & Statistical Data Analysis	3	3	
8	SECR1033	Computer Organization and Architecture	3	3	
9	SECP2523	Database *(WBL)	3	3	
10	SECP2613	System Analysis and Design *(WBL)	3	3	
11	SECJ2013	Data Structure and Algorithm	3	3	
12	SECR2213	Network Communication	3	3	
13	SECJ2154	Object Oriented Programming	4	3	
14	SECR2043	Operating Systems	3	3	
15	SECD3761	Technopreneurship Seminar	1	3	
16	SECJ3553	Artificial Intelligence	3	3	
17	SECP3204	Software Engineering *(WBL)	4	4	
18	SECP4114	Professional Development	4	4	
19	SECP4124	Professional Practice	4	4	
20	SECP4134	Professional Development and Practice Report	4	4	
21	SECP4112	Initial Industry Project Proposal	2	2	
22	SECP4223	Industrial Integrated Project Proposal	3	3	
23	SECP4235	Industrial Integrated Project Development	5	5	
24	SECP4234	Industrial Integrated Project Report	4	4	
ELECTIVES COURSES (31 CREDITS) – *Choose SECP3106 and 8 other elective courses from the following list.*					
25	SECP3723	System Development Technology (WBL)	3	3	
26	SECP2733	Multimedia Data Modeling *(WBL)	3	3	
27	SECP2633	Information Retrieval	3	3	

28	SECP2753	Data Mining	3	3	
29	SECP3133	High Performance Data Processing	3	3	
30	SECP3213	Business Intelligence	3	3	
31	SECP3623	Database Programming	3	3	
32	SECP3713	Database Administration	3	3	
33	SECP3223	Data Analytics Programming	3	3	
34	SECP3744	Enterprise System Design and Modeling (WBL)	4	4	
35	SECP3843	Special Topic in Data Engineering *(WBL)	3	3	
36	SECP3823	Knowledge Management Systems *(WBL)	3	3	
37	SECP3106	Application Development *(WBL)	6	6	
38	SECP3416	Management Information System *(WBL)	6	6	
TOTAL CREDIT OF COMPUTER SCIENCE COURSES (a)			**108**	**108**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
For Malaysian Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	
2	UHMS1182	Penghayatan Etika dan Peradaban	2	2	
For International Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	
	UHMS1182	Penghayatan Etika dan Peradaban			
2	UHLM1012	Malaysia Language for Communication	2	2	
Cluster 2: Generic Skills					
1	UBSS1032	Introduction to Entrepreneurship	2	2	
2	UHMT1012	Graduate Success Attributes	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQF2xx2	Service-Learning Co-curriculum Elective	2	2	
2	UKQT3001	Extracurricular Experiential Learning	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB1122	English Communication Skills	2	2	
2	UHLB2122	Academic Communication Skills	2	2	
3	UHLB3132	Professional Communication Skills	2	2	
4	UHLx1112	Foreign Language Elective	2	2	

Other University Electives					
1	Uxxx2xx2	Any 1 course from Cluster 2 or Cluster 3	2	2	
TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)			23	23	
TOTAL CREDIT TO GRADUATE (a + b + c)			131	131	

OTHER COMPULSORY COURSES		
No.	**PSC COURSE**	
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	
2	Talent and Competency Management	
3	English Communication Skills for Graduating Students (ECS)	
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	

COURSE SYNOPSIS

CORE COURSES

SECI1013 - Discrete Structure

This course introduces students to the principles and applications of discrete structure in the field of computer science. The topics that are covered in this course are set theory, proof techniques, relations, functions, recurrence relations, counting methods, graph theory, trees and finite automata. At the end of the course, the students should be able to use set theory, relations and functions to solve computer science problems, analyze and solve problems using recurrence relations and counting methods, apply graph theory and trees in real world problems and use deterministic finite automata finite state machines to model electronic devices and problems.

SECJ1013 - Programming Technique I

As a fundamental subject, this course equips the students with theory and practice on problem solving techniques by using the structured approach. Students are required to develop programs using C++ programming language, in order to solve simple to moderate problems. The course covers the following: pre-processor directives, constants and variables, data types, input and output statements, control structures: sequential, selection and loop, built-in and user-defined functions, single and two-dimensional arrays, file operations, pointers, and structured data types.

SECR1013 - Digital Logic

Digital electronics is the foundation of all microprocessor-based systems found in computers, robots, automobiles, and industrial control systems. This course introduces the students to digital electronics and provides a broad overview of many important concepts, components, and tools. Students will get up-to-date coverage of digital fundamentals-from basic concepts to programmable logic devices. Laboratory experiments provide hands-on experience with the simulator software, actual devices and circuits studied in the classroom.

SECP1513 - Technology & Information System

As a primer subject, this course will introduce students to information systems and technology (IS/IT), as well as its uses in daily life both at home and at work. Various aspects of IS/IT encompassing hardware, software, network, communications, internet, multimedia, graphics and systems applications will be introduced. Students will be equipped with basic skills in handling PC installation and productivity tools via practical work in the labs, which shall comprise a major part of the study. At the end of the course, student should be able to distinguish basic IS/IT component and applications.

SECI2143 - Probability & Statistical Data Analysis

This course is designed to introduce some statistical techniques as tools to analyse the data. In the beginning the students will be exposed with various forms of data. The data represented by the different types of variables are derived from different sources; daily and industrial activities. The analysis begins with the data representation visually. The course will also explore some methods of parameter estimation from different distributions. Further data

analysis is conducted by introducing the hypothesis testing. Some models are employed to fit groups of data. At the end of course the students should be able to apply some statistical models in analyzing data using available software.

SECJ1023 - Programming Technique II
Pre-requisite: SECJ1013 Programming Technique I
This course presents the concept of object orientation and object-oriented programming (OOP) techniques using the C++ programming language. It equips the students with the theory and practice on problem solving techniques using the object-oriented approach. It emphasizes on the implementation of the OOP concepts including encapsulations, associations and inheritance. At the end of this course, students should be able to apply the OOP techniques to solve problems.

SECR1033 - Computer Organization and Architecture
Pre-requisite: SECR1013 Digital Logic
This course was designed to give the understanding of basic concept of computer organization and architecture. Topics covered in this subject will be on computer performance, types of data and the representative, arithmetic manipulation, instruction execution, micro programmable control memory, pipelining, memory, input/output and instruction format. At the end of this course, the student should be able to understand the concept of overall computer component and realize the current technology in computer hardware.

SECV2113 - Human Computer Interaction
This course will introduce students to human-computer interaction theories and design processes. The emphasis will be on applied user experience (UX) design. The course will present an iterative evaluation-centered UX lifecycle and will introduce a broader notion of user experience, including usability, usefulness, and emotional impact. The lifecycle should be viewed as template intended to be instantiated in many different ways to match the constraints of a particular development project. The UX lifecycle activities we will cover include contextual inquiry and analysis, requirements extraction, design-informing models, design thinking, ideation, sketching, conceptual design, and formative evaluation.

SECP2523 - Database *(WBL)
This course introduces students to the concept of database system and how it can be used in daily human life and profession. The focus of the course is to equip students with knowledge and skills on important steps and techniques used in developing a database, especially in the conceptual and logical database design phase. Among topics covered are database environment, database design, entity relationship diagram, normalization, and structured query language (SQL). Students are taught to use a database management system (DBMS). Students are required to work on a project, i.e., to develop a database application system, for a selected organization. In this project, students are required to work closely with an organization during the process of analysis, designing and implementing the system and to use the learned techniques, DBMS and development tools in the development process. At the end of the course, students shall be able to apply the knowledge of designing and developing a good database system for a real-world problem.

SECP2613 - System Analysis and Design *(WBL)

The main focus of this course is to provide a practical approach of systems analysis and designing skills for the students using a structured methodology. Hence, the course enables students to study information system requirements for any system application within an organizational context. The contents are organized in sequence, which are planning, analysis, designing and implementation phases. From the resulting output of the planning and analysis phase shall enable students to form input, output, and interface design. Students are required to work on a project, i.e., to develop a database application system, for a selected organization. In this project, students are required to work closely with the organization during the process of analysis, designing and implementing the system by using the learned techniques. At the end of the course, students shall be able to apply the knowledge of designing and developing a good information system for a real-world problem.

SECJ2013 - Data Structure and Algorithm

Pre-requisite: SECJ1023 Programming Technique II

This course emphasis on data structure concepts theoretically and practically with detail algorithms for each of data structure. Students will learn abstract data type concepts using class and apply the concept in the implementation of data structures. Apart from it, student will learn recursive concept as a programming style and algorithm efficiency analysis with Big O notation. Various sorting and searching techniques will be discussed as data structure operations. Analysis of each algorithm will also be explained. Further, students will be exposed to linear data structures such as linked lists, stack and queue. Non-linear data structures such as tree and binary search tree will be discussed. Along the course, students should be able to implement and apply the theory and concepts of data structure in the assignments and mini project which are conducted in group.

SECR2213 - Network Communications

This course will discuss the basic topics of computer network and data communications. Based on TCP/IP Internet protocol stack, the course will apply top-down approach. Starts with the important and usage of computer network in commonly applications, the approach will go further detail in the technical aspect in data communication. At the end of this course, students will have an understanding and appreciation of how the network works.

SECR2043 - Operating Systems

Pre-requisite: SECR1033 Computer Organization and Architecture

This course covers introduction to operating systems, which serve as an interface between computer hardware and the user. The operating system is responsible for the management and coordination of processes, sharing of limited resources of the computer. Students will be exposed to the techniques and algorithms that may be applied in designing an operating system. Topics covered include process management, concurrency and synchronization, deadlock, memory management, file management, secondary storage management and I/O management. At the end of the course, the student shall have a clear understanding on the general concepts that underlie of an operating system.

SECJ2154 - Object Oriented Programming
Pre-requisite: SECJ1023 Programming Technique II
This course presents the concepts of object orientation and object-oriented programming techniques using Java programming language. It provides students with a thorough look at the basic constructs of the Java programming language such as its basic data types and operations. It also emphasizes on the use of standard Java APIs that allow students to develop text-based and GUI applications. It will also provide the programming techniques on exception handling and input/output files. At the end of this course, students should be able to use the basic constructs in object-oriented programming and utilize the selected Java APIs.

SECP3204 - Software Engineering *(WBL)
This course is designed to give students an introduction to an engineering approach in the development of high-quality software systems. It will discuss the important software engineering concepts in the various types of the common software process models. The students will also learn the concepts and techniques used in each software development phase Including requirements engineering, software design and software testing. This course will also expose the students to utilizing object-oriented method (e.g. UML) and tools in analyzing and designing the software. At the end of this course, students are expected to be able to appreciate most of the common software engineering concepts and techniques as well as producing various software artifacts, documentations, and deliverables. This course requires students to collaborate with a selected industry by building a high-quality software system required by the industry. Students are required to apply the most suitable software approach and techniques learned in the course. The industry involved will also contribute to a portion of assessment for the system build.

SECD3761 - Technopreneurship Seminar
This 1-credit course will involve, among others, with a series of lectures and/or reviewing entrepreneurship/technopreneurship case studies. Lectures may come from invited guest speakers who are successful entrepreneurs/technopreneurs to share their experiences in setting and building their companies.

SECP4114 - Professional Development
Professional Development refers to the placement of a student at an organization for a minimum of TWENTY (20) weeks. This course aims to provide a platform for the students to adapt with the working environment and gain their knowledge and working experience as well as developing their generic skills in a real career life when performing the tasks given by the organization. The students are jointly evaluated by supervisors from the school and the industry coach from the organization. The evaluation is focusing on students' generic skills.

SECP4124 - Professional Practice
Professional Practice refers to the placement of a student at an organization for a minimum of TWENTY (20) weeks. This course aims to provide a platform for the students to apply their knowledge learned in the university and at the workplace in solving organization’s problem with the supervision from organization supervisor. It is also intended for the students to experience handling real project in order to produce graduates who are credible, creative

and proficient. The students will be evaluated based on their performance by the organization and faculty's supervisor. The focus of the evaluation is based on work performance.

SECP4134 - Professional Development & Practice Report

In Professional Development & Practice Report, students will be evaluated based on four components; 1) technical report, 2) oral presentation, 3) log book and 4) ethics. The aim of the technical report is to educate the students in producing technical report and able to explain a specific detail on the tasks that have been done during the training. Students need to follow specified format in writing the technical report and submit it within the predetermined date. The students are required to present their training achievement to Professional Development & Practice supervisors (organization and supervisor). Students need to fill in the log book daily for the purpose of close monitoring between the students and supervisors. Student also needs to practice the good ethical values and work conduct throughout the training.

SECP 4112 - Initial Industry Project Proposal

This course is conducted at the industry where students perform their first semester internship. In this course, students are required to propose an initial idea on an industry project that deem to be suitable to be considered as a final year project which will be fully implemented in the second semester of their fourth year. The content of the proposal shall contain the project title, problem background, project objectives, project scopes, project methodology, and proposed solution. Students will present their initial proposal in a presentation session to a panel of examiners, which consists of a member from the industry and lecturers, to validate the proposed topic.

SECP 4223 - Industry Integrated Project Proposal

This course is also conducted at the industry where students perform their second semester internship. This course is an in-depth work based on the initial idea project proposal from SECP4112. Students are required to identify relevant information pertaining to the project needs and requirements, including identifying the objectives, producing project plan, conducting relevant literature reviews, producing the detail requirements of the project, and producing initial output or relevant designs for the project. These works are reported in a written report for the course. Students are also required to discuss their work with their supervisors (from faculty and industry) and report the progress by filling-up a log book throughout the semester. Students will present their proposal in a presentation session to a panel of examiners. Through this course students should acquire the knowledge and skills in project development methodology and the skill of writing an academic report which will be the basis of a final year industry integrated project report.

SECP4235 - Industrial Integrated Project Development

This course is also conducted at the industry where students perform their second semester internship. The objective for the students is to apply the knowledge learned in the university and boost their skills in implementing and completing the project. This course requires student to fully implement the project according to the specified project requirements as proposed in SECP4223. Based on the user and organization requirements, the students need to implement the full project development lifecycle, including coding, executing and/or

integrate modules and testing the developed project. Students are required to present the fully develop system to the user, organization and faculty, where their implemented project will be assessed by a panel of examiners.

SECP4234 - Industry Integrated Project Report

This course is also conducted at the industry where students perform their second semester internship. This course requires student to provide a complete report (i.e., a thesis) based on the project completed in SECP4235. The report shall contain the project requirements in full, with the objectives, problems and scopes are clearly written, the literature review on relevant topics related to projects, including the project methodology, the project designs, the project implementation and development (coding). It shall reflect the project development in full. and fulfil a project successfully at an organization or industry. The full report is considered asthe thesis for the student's final year project. The students are also required to consult their supervisors (industry and faculty) in the process of preparing the report, to ensure it fulfill the project developed and adhere to a written undergraduate thesis standard. The report will be assessed by a panel of examiners.

ELECTIVE COURSES

SECP3723 - System Development Technology *(WBL)

This course provides fundamental theories and practices of using basic technologies and components for web application developments. It focuses on standard XHTML/HTML for content creation, CSS for content presentation, JavaScript for client-side logics, PHP a server- side languages for business logics and data processing with MySQL database. Furthermore, the course will enable the student to build more powerful web solutions and advance to dynamic, database-enabled, website/intranet programming and applications using the open- source PHP scripting language and MySQL database. The course broadly comprises the fundamentals of programming with PHP, relational database design and operations with MySQL, and web solutions using PHP and MySQL. This course prepares students for the real web development process. This course will also expose students to industry's experiences for two months in web application development through sharing knowledge sessions and work-based learning activities with selected organization.

SECP2753 - Data Mining

This subject presents a comprehensive introduction to the understanding of knowledge discovery process in databases. Such methodological understanding is important to tackle projects of all sizes. A number of data mining techniques with its algorithms are explained. Students explore into the application of these techniques in both lab and industry. Students could apply the knowledge learnt to solve real world problems.

SECP2733 - Multimedia Data Modeling

With the explosion of digital multimedia information, large amounts of non-traditional forms of data such as text, image, video and audio are available in digital forms. Retrieval and storage of multimedia data is different from retrieval and storage of structured data. This subject presents a comprehensive introduction to multimedia databases that stores these types of data. The schematic description of a multimedia information retrieval system will be discussed and how its data are stored and retrieved. Storage structure, indexing, retrieval

and analysis of text, image, video and audio will be covered. Various methods of pattern recognition to derive high-level description of the data automatic approaches tom derive semantic annotation of the data will be discussed.

SECP3133 - High Performance Data Processing
High performance computing/parallel computing is widely used, nowadays, to execute complex systems and computations of complex problems that need to be solved with minimal time as possible. This course introduces the students to architectures of parallel computers, parallel algorithm design and parallel application programming using MPI and OpenMP packages in either C/C++ or Java programming languages. Student will experience hands-on programming practices on cluster computer.

SECP3213 - Business Intelligence
This course focuses on business intelligence to support a wide variety of management tasks in industry. Students learn to create business intelligence solutions, utilizing data mining methods, and applying artificial intelligence techniques for industrial decision support. Students will involve with industrial partners to apply the knowledge learnt to solve real world problems.

SECP3223 - Data Analytic Programming
This course introduces the use of Python specifically for Data Science. Students will learn about powerful ways to store and manipulate data to do data analysis. The course is divided into two parts. In Part 1, students will learn general programming practices and tools. Part 2 will focus more on data analysis, studying statistical techniques, machine learning and presentation of findings.

SECP3713 - Database Administration
This course prepares students with a firm foundation in basic database administration. It focuses on database administration (DBA) skills in general and specific skills needed to manage an enterprise level, large scale, relational database management system such as Oracle. The course looks at concepts underlying a database administration, among which are the database architecture, installation, configuration and operation. Students will also learn how to create an operational database and properly manage the various structures in an effective and efficient manner including performance monitoring, database security, user management, DBMS tuning and backup/recovery techniques. The lesson topics are reinforced with structured hands-on practices. This course prepares students for the corresponding certification examination (such as Oracle Certified Associate exam). This course will also expose students to industry's experiences in administrating databases through sharing knowledge sessions and work-based learning activities with selected organization.

SECP3744 - Enterprise Systems Design and Modeling *(WBL)
This subject presents a data management perspective to the Enterprise Information Systems in a contemporary organization. The course will introduce the importance of enterprise information system management, strategic role of information systems in an organization, enterprise system integration, enterprise value system and value chain modelling, view

integration and implementation compromises, and inter versus intra enterprise systems. Students will creatively explore real-world industry case study, identify problems and propose enterprise system solutions. This course will expose students to industry's experiences in Enterprise Systems through sharing knowledge sessions and/or work-based learning activities with selected organization. At the end of the semester, student shall be able to plan and manage the development of enterprise data and information systems.

SECP3843 - Special Topic in Data Engineering (WBL)

This course presents research and industrial issues pertaining to data engineering, database systems and technologies. Various topics of interests that are directly or indirectly relevant the data engineering tasks, database systems and technologies are explored and discussed. Participation in forums as well as face to face interaction, with researchers and practitioners on these topics are encouraged. Students should then be able to conduct their own investigation and deductions. This course will also expose students to industry's experiences through sharing knowledge sessions and/or work-based learning activities with selected organization.

SECP3823 - Knowledge Management System

This subject covers the basic concept of Knowledge Management including the definition and the importance of knowledge management, types of knowledge management systems (KMS), such as document management systems, decision support systems and group support systems. It focuses on the development and deployment of KMS. Several knowledge managements tools and technologies are introduced and real case studies are discussed. At the end of the course, students shall be able to develop basic KMS.

BACHELOR OF COMPUTER SCIENCE (COMPUTER NETWORKS & SECURITY) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Computer Science (Computer Networks & Security) with Honours is offered on a full-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru and is based on a 2-Semester per academic session.

The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years. Generally, students are expected to undertake courses equivalent to between twelve (12) to eighteen (18) credit hours per semester. Assessment is based on coursework and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Computer Science (Computer Network and Security) with Honours	
4. Final Award			Bachelor of Computer Science (Computer Network and Security) with Honours	
5. Programme Code			SECRH	
6. Professional or Statutory Body of Accreditation			Ministry of Higher Education	
7. Language(s) of Instruction			English	
8. Mode of Study (Conventional, distance learning, etc)			Conventional	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum: 4 years (8 semesters) Maximum: 6 years (12 Semesters)	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	20	14	14
Short	-	-	-	-

Course Classification

No	Classification	Credit Hours	Percentage
i.	University Courses a. General b. Language c. Co-Curriculum d. IT Entrepreneurship	 10 8 3 2	 17.6%
ii.	Core Courses	74	56.5%
iii.	Elective Courses	34	25.9%
	Total	**131**	**100%**
Total Credit Hours to Graduate		**131 credit hours**	

Award Requirements

To graduate, students must:

i. Achieve a total of 131 credit hours with minimum CPA of 2.0
ii. Pass industrial training (equivalent to 12 credit hours), which 4 credits will be graded and 8 credits as HW (Compulsory Attendance) status.
iii. Complete Computer Networks & Security Final Year Project.
iv. Pass 5 Professional Skills Certificate (PSC).

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Obtain employment in local and global industries and organization, where they are competent in applying the fundamental knowledge, computational principles and skills in computer network and security areas.
PEO2	Demonstrate the ability to learn and grow throughout their career and further contribute to the advancement of the computer network and security discipline.
PEO3	Develop software of increasing size and complexity, proficiently applying computer network and security theoretical knowledge across different application.
PEO4	Become leaders or technopreneurs in computer science discipline.
PEO5	Demonstrate an awareness of professional ethics and social responsibility as computer scientist.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Attain advanced knowledge to solve critical issues of a field in Computing.
PLO2	Critically solve and manage complex problems using systematic approaches.
PLO3	Adapt technical and scientific skills to solve problems in a field of Computer Network and Security.
PLO4	Demonstrate effective collaboration with stakeholders professionally.
PLO5	Use a broad range of information, media and technology to support study.
PLO6	Competently use digital technologies and software to support research works or studies.
PLO7	Analyse numerical and graphical data using quantitative or qualitative tools in solving problems.
PLO8	Demonstrate leadership, autonomy and responsibility in conducting and managing research and resources.
PLO9	Self-advancement through continuous academic or professional development.
PLO10	Initiate entrepreneurial project with relevant knowledge and expertise.
PLO11	Demonstrate respectable ethical conducts and professionalism skills in an organization and society.

COURSE MENU

YEAR 1 (SEPTEMBER)			
Code	**Course**	**Credit**	**Pre-requisite**
SECI1013	Discrete Structure	3	
SECJ1013	Programming Technique I	3	
SECP1513	Technology & Information System	3	
SECR1013	Digital Logic	3	
UHMT1012	Graduate Success Attributes	2	
MALAYSIAN STUDENTS			
UHIS1022	Falsafah dan Isu Semasa	2	
UHMS1182	Penghayatan Etika dan Peradaban	2	
INTERNATIONAL STUDENTS			
UHIS1022	Philosophy and Current Issues	2	
UHMS1182	Appreciation of Ethics and Civilisation		
UHLM1012	Malaysia Language for Communication 2	2	
TOTAL CREDITS		**18**	
CUMULATIVE CREDITS		**18**	

YEAR 1 (FEBRUARY)			
Code	**Course**	**Credit**	**Pre-requisite**
SECI1113	Computational Mathematics	3	
SECJ1023	Programming Technique II	3	SECJ1013
SECI2143	Probability & Statistical Data Analysis	3	
SECR1033	Computer Organisation and Architecture	3	SECR1013
SECV2113	Human Computer Interaction	3	
UHLB1112	English Communication Skills*	2	
TOTAL CREDITS		**17**	
CUMULATIVE CREDITS		**35**	
Notes: Students with minimum score of IELTS Band 5.5, TOEFL 525, TOEFL iBT 60, CEFR B2 and MUET Band 4 can apply for credit exemption for UHLB1112.			

YEAR 2 (SEPTEMBER)			
Code	**Course**	**Credit**	**Pre-requisite**
SECR1213	Network Communications (CCNA1)	3	SECR1013
SECD2523	Database	3	
SECD2613	System Analysis and Design	3	
SECJ2013	Data Structure and Algorithm	3	SECJ1023
SECR2043	Operating Systems	3	
UKQF2xx2	Service-Learning Co-curriculum Elective	2	
TOTAL CREDITS		**17**	
CUMULATIVE CREDITS		**52**	

YEAR 2 (FEBRUARY)			
Code	**Course**	**Credit**	**Pre-requisite**
SECV1223	Web Programming	3	SECD2523
SECJ2154	Object Oriented Programming	4	SECJ1023
SECJ2203	Software Engineering	3	
SECR2242	Computer Networks (CCNA2)	2	SECR1213
SECR2941	Computer Networks Lab	1	SECR1213
SECR3413	Computer Security	3	SECR2043
UHLB2122	Academic Communication Skills	2	UHLB1112
TOTAL CREDITS		**18**	
CUMULATIVE CREDITS		**70**	

YEAR 3 (SEPTEMBER)			
Code	**Course**	**Credit**	**Pre-requisite**
SECJ3553	Artificial Intelligence	3	SECJ2013
SECR3104	Applications Development	4	SECJ2203, SECD2523, SECV2223, SECR3413
SECR3242	Internetworking Technology (CCNA3 & 4)	2	SECR2242
SECR3941	Internetworking Technology Lab	1	SECR2941
SECR3443	Introduction to Cryptography	3	SECR3413
UHLB3132	Professional Communication Skills	2	UHLB2122
UHLx1112	Foreign Language Elective	2	
UKQT3001	Extracurricular Experiential Learning	1	
TOTAL CREDITS		**18**	

CUMULATIVE CREDITS	**88**	

YEAR 3 (FEBUARY)			
Code	**Course**	**Credit**	**Pre-requisite**
SECR3032	Computer Network & Security Project I	2	SECR3104
SECJ3203	Theory of Computer Science	3	SECI1013
SECD3761	Technopreneurship Seminar	1	
UBSS1032	Introduction to Entrepreneurship	2	
SECRxxx3	SECR Elective 1	3	
UHIT2302	Science and Technology Thinking	2	
Uxxx2xx2	General University Elective Course	2	
TOTAL CREDITS		**15**	
CUMULATIVE CREDITS		**106**	

YEAR 4 (SEPTEMBER)			
Code	**Course**	**Credit**	**Pre-requisite**
SECR4114	Industrial Training Report	4	92 credits CGPA >= 2.0
SECR4118	Industrial Training (HW)	8	
TOTAL CREDITS		**12**	
CUMULATIVE CREDITS		**118**	

YEAR 4 (FEBRUARY)			
Code	**Course**	**Credit**	**Pre-requisite**
SECR4134	Computer Network & Security Project II	4	SECR3032
SECRxxx3	SECR Elective 2	3	
SECx5xx3	PRISMS Elective 1		
SECRxxx3	SECR Elective 3	3	
SECx5xx3	PRISMS Elective 2		
SECRxxx3	SECR Elective 4	3	
SECx5xx3	PRISMS Elective 3		
SECRxxx3	SECR Elective 5	3	
SECx5xx3	PRISMS Elective 4		
TOTAL CREDITS		**16**	
CUMULATIVE CREDITS		**131**	

SECR Elective Courses (CHOOSE 5)			
Code	**Course**	**Credit**	**Pre-requisite**
SECR3223	High Performance & Parallel Computing	3	SECJ1023
SECR3253	Network Programming	3	SECJ1013
SECR3263	Wireless Sensor Network	3	SECR2242
SECR4453	Network Security	3	SECR2242
SECR4483	Secure Programming	3	SECR3443
SECR4973	Special Topics on Computer Network & Security	3	

PRISMS ELECTIVE COURSES

For students who intend to enrol in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.The PRISMS elective begins with code SECP/J/R5XX3.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in the course menu including the 5 compulsory Professional Skills Certificate Courses. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not eligible to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
COMPUTER SCIENCE COURSES					
CORE COURSES (74 CREDITS)					
1	SECI1013	Discrete Structure	3	3	
2	SECJ1013	Programming Technique I	3	3	
3	SECR1013	Digital Logic	3	3	
4	SECP1513	Technology & Information System	3	3	
5	SECI1113	Computational Mathematics	3	3	
6	SECI2143	Probability & Statistical Data Analysis	3	3	
7	SECJ1023	Programming Technique II	3	3	
8	SECR1033	Computer Organisation and Architecture	3	3	
9	SECD2523	Database	3	3	
10	SECD2613	System Analysis and Design	3	3	
11	SECJ2013	Data Structure and Algorithm	3	3	
12	SECR1213	Network Communications	3	3	
13	SECV2113	Human Computer Interaction	3	3	
14	SECJ2203	Software Engineering	3	3	
15	SECV1223	Web Programming	3	3	
16	SECR2043	Operating Systems	3	3	
17	SECJ2154	Object Oriented Programming	4	4	
18	SECR3032	Computer Networks and Security Project I	2	2	
19	SECJ3203	Theory of Computer Science	3	3	
20	SECR4118	Industrial Training	8	HW	
21	SECR4114	Industrial Training Report	4	4	
22	SECR4134	Computer Networks and Security Project II	4	4	
23	SCSD3761	Technopreneurship Seminar	1	1	
ELECTIVES COURSES (34 CREDITS) – *Choose SECR3104 and 10 other elective courses from the following list (which can include up to maximum of 4 PRISMS courses, for qualified students)*					
SECR ELECTIVES COURSES					
24	SECR3104	Applications Development	4	4	
25	SECJ3553	Artificial Intelligence	3	3	
26	SECR2242	Computer Networks	2	3	
27	SECR2941	Computer Networks Lab	1	3	
28	SECR3241	Internetworking Technology	2	4	
29	SECR3941	Internetworking Technology Lab	1	3	
30	SECR3413	Computer Security	3	3	
31	SECR3443	Cryptography	3	3	

32	SECR3223	High Performance & Parallel Computing	3	3	
33	SECR3253	Network Programming	3	3	
34	SECR3263	Wireless Sensor Network	3	3	
35	SECR4453	Network Security	3	3	
36	SECR4483	Secure Programming	3	3	
37	SECR4973	Special Topics on Computer Network & Security	3	3	
PRISMS *ELECTIVES COURSES*					
38	SECR5013	Cryptographic Engineering	3	3	
39	SECR5023	Digital Forensics	3	3	
40	SECR5033	Information Security Governance and Risk Management	3	3	
41	SECR5043	Cloud Computing Security	3	3	
42	SECR5053	Penetration Testing	3	3	
43	SECJ5013	Secure Software Engineering	3	3	
44	SECJ5023	Advanced Theory of Computer Science	3	3	
45	SECJ5033	Advanced Data Structure and Algorithms	3	3	
46	SECJ5043	Advanced Artificial Intelligence	3	3	
47	SECP5013	Advanced Analytics for Data Science	3	3	
48	SECP5023	Big Data Management	3	3	
49	SECP5033	Business Intelligence and Analytics	3	3	
50	SECP5043	Data Science Governance	3	3	
51	SECP5053	Massive Mining and Streaming	3	3	
52	SECP5063	Statistics for Data Science	3	3	
TOTAL CREDIT OF COMPUTER SCIENCE COURSES (a)			**108**	**100**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
For Malaysian Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	
2	UHMS1182	Penghayatan Etika dan Peradaban	2	2	
For International Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	
	UHMS1182	Penghayatan Etika dan Peradaban			
2	UHLM1012	Malaysia Language for Communication	2	2	
Cluster 2: Generic Skills					
1	UBSS1032	Introduction to Entrepreneurship	2	2	
2	UHMT1012	Graduate Success Attributes	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQF2xx2	Service Learning Co-curriculum Elective	2	2	
2	UKQT3001	Extracurricular Experiential Learning	1	1	
Cluster 5: Language Skills					

(Language Academy, Faculty of Social Sciences and Humanities)					
1	UHLB1122	English Communication Skills	2	2	
2	UHLB2122	Academic Communication Skills	2	2	
3	UHLB3132	Professional Communication Skills	2	2	
4	UHLx1112	Foreign Language Elective	2	2	
Other University Electives					
1	Uxxx2xx2	Any 1 course from Cluster 2 or Cluster 3	2	2	
TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)			23	23	
TOTAL CREDIT TO GRADUATE (a + b + c)			131	123	

OTHER COMPULSORY COURSES		
No.	**PSC COURSE**	
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	
2	Talent and Competency Management	
3	English Communication Skills for Graduating Students (ECS)	
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	
5.	Choose ONE elective course from the following list: 5. Data Analytics for Organization 6. Construction Measurement (Mechanical & Electrical Works) 7. Professional Ethics and Integrity 8. Other electives courses offered in future	

COURSE SYNOPSIS

CORE COURSES

SECI1013 - Discrete Structure

This course introduces students to the principles and applications of discrete structure in the field of computer science. The topics that are covered in this course are set theory, proof techniques, relations, functions, recurrence relations, counting methods, graph theory, trees and finite automata. At the end of the course, the students should be able to use set theory, relations and functions to solve computer science problems, analyse and solve problems using recurrence relations and counting methods, apply graph theory and trees in real world problems and use deterministic finite automata finite state machines to model electronic devices and problems.

SECI1113 - Computational Mathematics

This course is a combination of linear algebra and numerical methods as preparation for computer science student to apply mathematics knowledge in core knowledge of computer science. The first part of this course is an introduction to linear algebra. The topics that are covered in linear algebra are linear equations, linear combinations, linear independence, linear transformation, and vector spaces. The second part of this course covers numerical methods that can be used to solve non-linear equation, linear systems, eigenvalue problems, interpolation, differentiation and integration. At the end of the course, students should be able to apply mathematics knowledge to solve mathematical problems. Implementation of engineering tools such as MATLAB, would enhance student to use simple programming technique for solving mathematical problems.

SECJ1013 - Programming Technique I

As a fundamental subject, this course equips the students with theory and practice on problem solving techniques by using the structured approach. Students are required to develop programs using C++ programming language, in order to solve simple to moderate problems. The course covers the following: pre-processor directives, constants and variables, data types, input and output statements, control structures: sequential, selection and loop, built-in and user-defined functions, single and two-dimensional arrays, file operations, pointers, and structured data types.

SECJ1023 - Programming Technique II

Pre-requisite: SECJ1013 Programming Technique I

This course presents the concept of object orientation and object-oriented programming (OOP) techniques using the C++ programming language. It equips the students with the theory and practice on problem solving techniques using the object-oriented approach. It emphasizes on the implementation of the OOP concepts including encapsulations, associations and inheritance. At the end of this course, students should be able to apply the OOP techniques to solve problems.

SECP1513 - Technology & Information System

As a primer subject, this course will introduce students to information systems and technology (IS/IT), as well as its uses in daily life both at home and at work. Various aspects of IS/IT encompassing hardware, software, network, communications, internet, multimedia, graphics and systems applications will be introduced. Students will be equipped with basic skills in handling PC installation and productivity tools via practical work in the labs, which shall comprise a major part of the study. At the end of the course, student should be able to distinguish basic IS/IT component and applications.

SECR1013 - Digital Logic

Digital electronics is the foundation of all microprocessor-based systems found in computers, robots, automobiles, and industrial control systems. This course introduces the students to digital electronics and provides a broad overview of many important concepts, components, and tools. Students will get up-to-date coverage of digital fundamentals-from basic concepts to programmable logic devices. Laboratory experiments provide hands-on experience with the simulator software, actual devices and circuits studied in the classroom.

SECR1213 - Network Communications

This course will discuss the basic topics of computer network and data communications. Based on TCP/IP Internet protocol stack, the course will apply top down approach. Starts with the important and usage of computer network in commonly applications, the approach will go further detail in the technical aspect in data communication. At the end of this course, students will have an understanding and appreciation of how the network works.

SECV1223 - Web Programming

This course is designed to introduce students the fundamental of knowledge, technologies and components for web application developments. The basic topics includes the standard HTML for content creation, CSS for content presentation, JavaScript for client-side logics, PHP for server-side logics and MySQL for database processing. At the end of the course, the students should be able to apply the web base technologies and then implement it all in the creating functional data-centric online system project.

SECD2523 - Database

This course introduces students to the concept of database system and how it is used in daily human life and profession. The focus of the course is to equip students with the knowledge and skills on important steps and techniques used in developing a database, especially in the conceptual and logical database design phase. Among topics covered are database environment, database design, entity relationship diagram, normalization, and structured query language (SQL). Students will be taught to use a database management system (DBMS). Students are required to design and develop the database component of an information system using the learned techniques, DBMS and a development tool. At the end of the course, students should be able to apply the knowledge of designing and developing a good database system.

SECD2613 - System Analysis and Design

The main focus of this course is to provide a practical approach of systems analysis and designing skills for the students using structured methodology. Hence the course enables students to study information system requirements for any system application within an organizational context. The contents are sequentially organized directly from planning, analysis, designing and implementation phases. From the resulting output of the planning and analysis phase shall enable students to form input, output and interface design. Hence a prototype design can be demonstrated.

SECl2143 - Probability & Statistical Data Analysis

This course is designed to introduce some statistical techniques as tools to analyse the data. In the beginning the students will be exposed with various forms of data. The data represented by the different types of variables are derived from different sources; daily and industrial activities. The analysis begins with the data representation visually. The course will also explore some methods of parameter estimation from different distributions. Further data analysis is conducted by introducing the hypothesis testing. Some models are employed to fit groups of data. At the end of course the students should be able to apply some statistical models in analysing data using available software.

SECJ2013 - Data Structure and Algorithm

Pre-requisite: SECJ1023 Programming Technique II

This course emphasis on data structure concepts theoretically and practically with detail algorithms for each of data structure. Students will learn abstract data type concepts using class and apply the concept in the implementation of data structures. Apart from it, student will learn recursive concept as a programming style and algorithm efficiency analysis with Big O notation. Various sorting and searching techniques will be discussed as data structure operations. Analysis of each algorithm will also be explained. Further, students will be exposed to linear data structures such as linked lists, stack and queue. Non-linear data structures such as tree and binary search tree will be discussed. Along the course, studentsshould be able to implement and apply the theory and concepts of data structure in the assignments and mini project which are conducted in group.

SECJ2203 - Software Engineering

This course is designed to give students an introduction to an engineering approach in the development of high-quality software systems. It will discuss the important software engineering concepts in the various types of the common software process models. The students will also learn the concepts and techniques used in each software development phase including requirements engineering, software design and software testing. This course will also expose the students to utilizing object-oriented method (e.g. UML) and tools in analysing and designing the software. At the end of this course, students are expected to be able to appreciate most of the common software engineering concepts and techniques as well as producing various software artefacts, documentations, and deliverables.

SECJ2154 - Object Oriented Programming
Pre-requisite: SECJ1023 Programming Technique II
This course presents the concepts of object orientation and object-oriented programming techniques using Java programming language. It provides students with a thorough look at the basic constructs of the Java programming language such as its basic data types and operations. It also emphasizes on the use of standard Java APIs that allow students to develop text-based and GUI applications. It will also provide the programming techniques on exception handling and input/output files. At the end of this course, students should be able to use the basic constructs in object-oriented programming and utilize the selected Java APIs.

SECR1033 - Computer Organisation and Architecture
Pre-requisite: SECR1013 Digital Logic
This course was designed to give the understanding of basic concept of computer organization and architecture. Topics covered in this subject will be on computer performance, types of data and the representative, arithmetic manipulation, instruction execution, micro programmable control memory, pipelining, memory, input/output and instruction format. At the end of this course, the student should be able to understand the concept of overall computer component and realize the current technology in computer hardware.

SECR2043 - Operating Systems
This course covers introduction to operating systems, which serve as an interface between computer hardware and the user. The operating system is responsible for the management and coordination of processes, sharing of limited resources of the computer. Students will be exposed to the techniques and algorithms that may be applied in designing an operating system. Topics covered include process management, concurrency and synchronization, deadlock, memory management, file management, secondary storage management and I/O management. At the end of the course, the student shall have a clear understanding on the general concepts that underlie of an operating system.

SECV2113 - Human Computer Interaction
This course will introduce students to human-computer interaction theories and design processes. The emphasis will be on applied user experience (UX) design. The course will present an iterative evaluation centred UX lifecycle and will introduce a broader notion of user experience, including usability, usefulness, and emotional impact. The lifecycle should be viewed as template intended to be instantiated in many different ways to match the constraints of a particular development project. The UX lifecycle activities we will cover include contextual inquiry and analysis, requirements extraction, design-informing models, design thinking, ideation, sketching, conceptual design, and formative evaluation.

SECD3761 - Technopreneurship Seminar
This 1-credit course will provide module and training for students on how to generate digital income through crowdsourcing platforms and methods. Crowdsourcing is a method to generate online income which the work is offered and implemented digitally in global platforms.

SECJ3203 - Theory of Computer Science
Pre-requisite: SECI1013 Discrete Structure
The goal of this course is to provide students with an understanding of basic concepts in the theory of computation. This course introduces students to formal languages and automata theory. It will emphasize on languages, grammars and abstract machines i.e. Regular Language, Context Free Language, Regular Grammar, Context Free Grammar, Finite Automata, Push Down Automata and Turing Machine. The course will also provide practice on the acceptability of input string by these machines. At the end of the course, students should be able to apply the theory in constructing these abstract machines and testing them with the right input strings.

SECR3032 - Computer Networks & Security Project I
Pre-requisite: SECR3104 Application Development
This is the initial part of a 2-part Final Year Project that every student must fulfil successfully. Students are introduced to the methodologies of research and application development through a series of lectures. Students are guided through a step-by-step practice to complete the initial stages of proposal, planning and design of a project. Students must also meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their initial work.

SECR4118 - Industrial Training (HW)
Pre-requisite: 92 credits AND CGPA >= 2.0
Industrial Training refers to the placement of a student at an organization for a minimum of 20 weeks to elevate students' knowledge and skills in a specific database profession and at the same time produce graduates who are credible, creative and proficient. This course aims to provide a platform for the students apply their knowledge learned in the university and boost their skills which needed by a profession. It is also intended for the students to gain exposure in every aspect of real career life. The students will be evaluated based on two components; 1) student performance evaluation by organisation supervisor and 2) student performance evaluation by faculty supervisor. The organization supervisor is expected to assess the student performance based on work performance and student's personality. The assessment by faculty supervisor more focusing on students' generic skills.

SECR4114 - Industrial Training Report
Pre-requisite: 92 credits AND CGPA >= 2.0
Industrial Training Report refers to the placement of a student at an organization for a minimum of 20 weeks to experience and apply their theoretical knowledge in the industrial training. The students will be evaluated based on four components; 1) technical report, 2) oral presentation, 3) logbook and 4) ethics. The aim of the technical report is to educate the students in producing related technical report and able to explain a specific detail on the tasks that have been done during the training. Students need to follow specified format in writing the technical report and submit it within the predetermined date. The students are required to present their training achievement to Industrial Training supervisors (organization and supervisor). Students need to fill in the online logbook daily for the purpose of close monitoring between the students and supervisors. Student also needs to practice the good ethical values and work conduct throughout the training. The passing mark is 60%.

SECR4134 - Computer Networks & Security Project II
Pre-requisite: SECR3032 Computer Networks & Security Project I
This is the second part of a 2-part Final Year Project that every student must fulfil successfully. In this installation, students are required to execute the next phases of their development plan from Part1. Students are now required to code and integrate the different modules that make up the proposed project. Students will test the developed modules and the final fully integrated project following software development and research testing practices. Students must meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their final work.

COMPULSORY PROGRAMME COURSES

SECR2242 - Computer Networks & SECR2941 Computer Networks Lab
Pre-requisite: SECR1213 Network Communications
This course will discuss the routing and switching concepts in computer networking specifically in local area network (LAN). The course starts with the architecture, components and operation of routers and switches and furthermore discusses the operation of Virtual LAN (VLAN), Access control list (ACL) and Network Address Translation (NAT).

SECR3104 - Applications Development
Pre-requisite: SECD2523 Database, SECV1213 Web Programming, SECJ2203 Software Engineering, SECR3413 Computer Security
Application Development is a comprehensive service-learning course which requires student to solve a real community problem by developing an application. Students will learn how to practice design thinking, adopting Agile development methodology. This involves an iterative process starting from community engagement, requirement elicitation and analysis, design solution, application construction and iterative verification process. Students are required to do reflection on the outcome of the project. In this course students should be able to develop their soft skills such as leadership, team collaboration, documentation process and communication skill.

SECJ3553 - Artificial Intelligence
Pre-requisite: SECJ2013 Data Structure and Algorithm
This course offers students a new perspective on the study of Artificial Intelligence (AI) concepts. The essential topics and theory of AI are presented, but it also includes practical information on data input and reduction as well as data output (i.e. algorithm usage). In particular, this course emphasizes on theoretical and practical aspects of various search algorithms, knowledge representations, and machine learning methods. The course features practical implementations through assignments undertaken both individually and in groups

SECR3242 - Inter-Network Technology & SECR3941 Inter-Network Technology Lab
Pre-requisite: SECR2242 Computer Networks & SECR2941 Computer Networks Lab
This course will discuss related to scaling and connecting networks in a wide area network (WAN). The course starts with enhancing LAN and discusses two most popular routing protocols i.e. EIGRP and OSPF. Furthermore, the course will cover on WAN interconnection, security issues and Quality of Service). At the end of this course, students will be able to design and configure enhanced VLAN, WAN connection and network troubleshooting

SECR3413 - Computer Security
Pre-requisite: SECR2043 Operating Systems
This course helps to equip students with basic principles in computer security including its issues and requirements. It covers the topics of the threats to computer as well as other general security areas such as program and network, evaluating the relative risks of these threats and developing cost-effective and user-friendly countermeasures. At the end of this course, the student should gain some knowledge and experience with respect to the risks of secure computing.

SECR3443 - Cryptography
Pre-requisite: SECR3413 Computer Security
This course will introduce the concepts of fundamental cryptography and its applications. The topics that will be covered are evolution of cryptography, number theory, information theory, symmetric and asymmetric cryptography and message authentication. Several cryptographic structures and the characteristics of the algorithms that provide the strength to the algorithms will also be discussed. At the end of the course, the student should be able to apply the knowledge in developing application with security features.

PROGRAMME ELECTIVE COURSES

SECR3223 - High Performance & Parallel Programming
Pre-requisite: SECJ1023 Programming Technique II
High performance computing/parallel computing is widely used, nowadays, to execute complex systems and computations of complex problems that need to be solved with minimal time as possible. This course introduces the students to architectures of parallel computers, parallel algorithm design and parallel application programming using MPI and OpenMP packages in C/C++ programming language. Student will experience hands-on programming practices on cluster computer.

SECR3253 - Network Programming
Pre-requisite: SECR1213 Network Communications
This course covers various techniques and technologies to develop network applications. Topics cover from networking fundamentals, to remote procedure call, including TCP and UDP sockets, multicasting, multimedia network application, and peer-to-peer computing.

SECR3263 - Wireless Sensor Network
Pre-requisite: SECR1213 Network Communications
This course will discuss on the topics of Wireless Sensor Networks (WSNs) technology, which collect information and pass the information via wireless networks to achieve a high level of desired monitoring and control in coordinated manners. In this course, the student will be expose to various protocols proposed for WSNs based on top-down approach at each layer of OSI model. Furthermore, the analyses of advantages and disadvantages of those protocols and their applicability and performance in different application will be carried out. In this way the students will be exposed to the creation of technology as the evolution of

different technologies before. At the end of this course the student will have an understanding in the area of Wireless Sensor Networks.

SECR4283 - Network Analysis & Design Simulation
Pre-requisite: SECR2242 Computer Networks
This course presents the main ideas on how to study a LAN performance, to design a new computer network using latest technologies with basic security features, and how to forecast computer network performance using simulation technique with NS3 simulator.

SECR4433 - Penetration Testing
Pre-requisite: SECR2043 Operating System & SECR3413 Computer Security
This course will discuss issues pertaining to penetration testing, finding vulnerabilities in various computer systems and exploiting them in an ethical manner. Emphasis is given on the fundamental theory and as well as hands on practice. Topics covered include information reconnaissance, web application pen testing, wireless pen testing, network pen testing, and mobile application pen testing.

SECR4453 - Network Security
Pre-requisite: SECR2941 Computer Networks Lab & SECR3413 Computer Security
This course educates students about the overall security process based on a security policy design, implementation and management. Emphasis is placed on security technologies, products and solutions; and on firewall and secure router design, installation, configuration, and maintenance. The course covers authentication, authorization, and accounting (AAA) implementation using routers and firewalls and security the network at both Layer 2 and 3 of the OSI model, intrusion prevention system (IPS) and virtual private network (VPN) implementations using routers and firewalls. Finally, managing a secure network is also discussed during the lecture.

SECR4473 - Security Management
Pre-requisite: SECR3413 Computer Security
The course is aimed at imparting knowledge and skill sets required to assume the overall responsibilities of administration and management of security of an enterprise information system. This course covers issues related to administration and management of security of enterprise information systems. Topics include auditing and data management, risk management, contingency planning, incident handling and responses. The course will study in detail principles and tools related to these topics. The course will also cover security standards, evaluation and certification process; security planning, ethical and legal issues in information and privacy.

SECR4483 - Secure Programming
Pre-requisite: SECJ1023 Programming Technique II, SECR2043 Operating System SECR3413 Computer Security
This course covers various techniques and technologies to develop secure applications using Java Programming Language. Topics cover from Basic Security Concepts to Authentication and Authorization, including Cryptography Fundamental, Keys & Certificates, Key Management, Message Digests, Digital Signatures, Cipher-based Encryption and SSL &

HTTPS. At the end of this course student should be able to design and develop secure application based on current security technologies.

SECR4493 - Computer Forensic
Pre-requisite: SECR3413 Computer Security
This course educates students on the overall computer forensic principles and practices. Emphasis is given on the fundamental knowledge of digital forensics investigations, such as types of crimes and evidences, basic computer investigation, evidence acquisition and legal and ethical issues. Hands on practice on selected tools are also added to give a more holistic view of an investigation process. Real case examples are studied and discussed to enhance critical and investigative thinking.

SECR4973 - Special Topics on Network & Security
Pre-requisite: Depends on the topic
This course is aimed to expose students to specific topics in Computer networks and Security. Topics such as optical networks, wireless sensor networks and cloud computing will be discussed. Students will learn the concepts, application domain, trends and security challenges of these topics. Students will be given self-reading assignments to further enhance their understanding of the course. Student will learn how to write.

BACHELOR OF COMPUTER SCIENCE (GRAPHICS AND MULTIMEDIA SOFTWARE) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Computer Science (Graphics and Multimedia Software) with Honours is offered on a full-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fourteen (14) to eighteen (18) credit hours per semester. Assessment is based on coursework and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Computer Science (Graphics and Multimedia Software) with Honours	
4. Final Award			Bachelor of Computer Science (Graphics and Multimedia Software) with Honours	
5. Programme Code			SECVH	
6. Professional or Statutory Body of Accreditation			Ministry of Higher Education	
7. Language(s) of Instruction			English	
8. Mode of Study (Conventional, distance learning, etc)			Conventional	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum : 4 years (8 semesters) Maximum : 6 years (12 Semesters)	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	20	14	14
Short	-	-	-	-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses a) General b) Language c) Co-Curriculum d) IT Entrepreneurship	 10 8 3 2	17.6%
ii.	Core Courses	74	56.5%
iii.	Elective Courses	34	25.9%
	Total	**131**	**100%**
A	Engineering Courses a) Lecture/Project/Laboratory b) Workshop/ Field/ Design Studio c) Industrial Training d) Final Year Project	Nil	Nil
	Total Credit Hours for Part A		
B	Related Courses a) Applied Science/ Mathematic /Computer b) Management/Law/Humanities/ Ethics/Economy c) Language d) Co-Curriculum	Nil	Nil
	Total Credit Hours for Part B		
	Total Credit Hours for Part A and B	**Nil**	
	Total Credit Hours to Graduate	**131 credit hours**	

Award Requirements

To graduate, students must:

- Achieve a total of 131 credit hours with minimum CPA of 2.0
- Pass industrial training (equivalent to 12 credit hours), which 4 credits will be graded and 8 credits as HW (Compulsory Attendance) status.
- Complete Graphics and Multimedia Software Final Year Project.
- Pass 5 Professional Skills Certificate (PSC).

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Obtain employment as computer scientists in local and global industries and organisations, where they are competent in applying the relevant knowledge, computational principles and skills in Computer Graphics and Multimedia fields to develop software of increasing size and complexity across different application areas
PEO2	Demonstrate an ability to continue to learn throughout their career (professional, technical or postgraduate education) which can strengthen their analytical and critical thinking skills to position them to advanced computer graphic and multimedia practices and to contribute to the intellectual foundations of the Computer Graphics and Multimedia disciplines.
PEO3	Involve in computer graphics and multimedia software projects that they are proficient in applying theoretical computing and knowledge in analysing, modelling, designing, developing and evaluating computing solutions.
PEO4	Becoming leaders or technopreneurs in graphics and multimedia software discipline with combination skills
PEO5	Demonstrate an awareness of professional ethics and social responsibility as computer scientists specialising in computer graphics and multimedia.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Ability to acquire and apply knowledge of Computer Sciences and Graphics and Multimedia Software fundamentals.
PLO2	Ability to demonstrate comprehensive problem analysis and creative design skill to solve and manage complex computing problems using systematic and current approaches
PLO3	Ability to demonstrate technical and scientific expertise in a field of graphics and multimedia software
PLO4	Ability to perform effective collaboration with stakeholders professionally
PLO5	Ability to communicate effectively both in written and spoken form with other professionals and community
PLO6	Ability to use digital technologies and software to support studies competently
PLO7	Ability to analyse numerical or graphical data using quantitative or qualitative tools in solving problems
PLO8	Ability to function individually or in teams, effectively, with a capability to be a leader.
PLO9	Ability to self-advancement through continuous academic or professional development
PLO10	Ability to initiate entrepreneurial project with relevant knowledge and expertise
PLO11	Ability to conduct respectable, ethical and professional practices in organization and society

COURSE MENU

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECI1013	Discrete Structure	3	
SECJ1013	Programming Technique I	3	
SECR1013	Digital Logic	3	
SECP1513	Technology & Information System	3	
UHMT1012	Graduate Success Attributes	2	
Malaysian Students			
UHIS1022	Falsafah dan Isu Semasa	2	
UHMS1182	Penghayatan Etika dan Peradaban	2	
International Students			
UHLB1122*	English Communication Skills	2	
UHIT2302	The Thought of Sciences and Technology	2	
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**18**	
** Students with minimum score of IELTS Band 5.5, TOEFL 525, TOEFL iBT 60, CEFR B2 and MUET Band 4 can apply for credit exemption for UHLB1112*			

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECV1113	Mathematics for Computer Graphics	3	
SECI1143	Probability & Statistical Data Analysis	3	
SECJ1023	Programming Technique II	3	SECJ1013
SECR1033	Computer Organisation and Architecture	3	SECR1013
Malaysian Students			
UHIT2302	The Thought of Sciences and Technology	2	
UHLB1122*	English Communication Skills	2	
International Students			
UHLM1012	Malaysia Language for Communication	2	
UHLB2122	Academic Communication Skills	2	
UHLB1122	English Communication Skills	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**34**	
** Students with minimum score of IELTS Band 5.5, TOEFL 525, TOEFL iBT 60, CEFR B2 and MUET Band 4 can apply for credit exemption for UHLB1112*			

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECD2523	Database	3	
SECD2613	System Analysis and Design	3	
SECJ2013	Data Structure and Algorithm	3	SECJ1023
SECR2213	Network Communications	3	
SECV2113	Human Computer Interaction	3	
UKQF2xx2	Service-Learning Co-curriculum Elective	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**51**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECJ2203	Software Engineering	3	
SECV2223	Web Programming	3	
SECR2043	Operating Systems	3	SECR1033
SECJ2154	Object Oriented Programming	4	SECJ1023
Elective Courses - Choose 1 (3 Credits)			
SECV2213	Fundamental of Computer Graphics	3	SECV1113 SECJ1023
SECJ2363	Software Project Management	3	
Malaysian Students			
UHLB2122	Academic Communication Skills	2	
International Students			
UHIS1022	Falsafah dan Isu Semasa	2	
UHMS1182	Penghayatan Etika dan Peradaban		
	TOTAL CREDIT	**18**	
	CUMULATIVE CREDITS	**69**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
UHLB3132	Professional Communication Skills	2	
UHLx 1122	Foreign Language Elective	2	
UKQE 3001	Extracurricular Experiential Learning	1	
Elective Courses - Choose 4 (13 Credits)			
SECV3104	Applications Development	4	SECJ2203, SECD2523, SECV2223, SECJ2154
SECJ3553	Artificial Intelligence	3	SECJ2013
SECV3113	Geometric Modelling	3	SECV2213
SECV3213	Fundamental of Image Processing	3	
SECJ3263	Mobile Application Programming	3	SECJ2154
	TOTAL CREDIT	**18**	

	CUMULATIVE CREDITS	**87**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECV3032	Graphics and Multimedia Software Project I	2	SECV3104
SECJ3203	Theory of Computer Science	3	SECI1013, SECJ2013
Elective Courses - Choose 4 (12 Credits)			
SECV3223	Multimedia Data Processing	3	SECJ1023
SECJ3563	Computational Intelligence	3	SECJ3553
SECV3263	Multimedia Web Programming	3	
SECV3233	Data Visualisation	3	
SECV3123	Real-time Computer Graphics	3	SECV2213
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**104**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SECV4118	Industrial Training (HW)	8	92 credits & CGPA >= 2.0
SECV4114	Industrial Training Report	4	
	TOTAL CREDIT	**12**	
	CUMULATIVE CREDITS	**116**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECV4134	Graphics and Multimedia Software Project II	4	SECV3032
SECD3761	Technopreneurship Seminar	1	
UBSS1032	Introduction to Entrepreneurship	2	
UXXX 2xx2	Enrichment of Knowledge Elective	2	
UXXX2XX2	Generic Skill Elective		
Elective Courses - Choose 2 (6 Credits)			
SECV4213	Computer Games Development	3	SECV3123
SECV4233	Advanced Computer Graphics	3	SECV2213
SECV4273	Introduction to Speech Recognition	3	SECJ1023
SECP5xx3/ SECJ5xx3/ SECR5xx3	PRISMS Elective 1	3	
SECP5xx3/ SECJ5xx3/ SECR5xx3	PRISMS Elective 2	3	
	TOTAL CREDIT	**15**	
	CUMULATIVE CREDITS	**131**	

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme. The PRISMS elective begins with code SECP/J/R5XX3.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
COMPUTER SCIENCE COURSES					
CORE COURSES (74 CREDITS)					
1	SECI1013	Discrete Structure	3	3	
2	SECJ1013	Programming Technique I	3	3	
3	SECR1013	Digital Logic	3	3	
4	SECP1513	Technology & Information System	3	3	
5	SECV1113	Mathematics for Computer Graphics	3	3	
6	SECI1143	Probability & Statistical Data Analysis	3	3	
7	SECJ1023	Programming Technique II	3	3	
8	SECR1033	Computer Organisation and Architecture	3	3	
9	SECD2523	Database	3	3	
10	SECD2613	System Analysis and Design	3	3	
11	SECJ2013	Data Structure and Algorithm	3	3	
12	SECR2213	Network Communications	3	3	
13	SECV2113	Human Computer Interaction	3	3	
14	SECJ2203	Software Engineering	3	3	
15	SECV2223	Web Programming	3	3	
16	SECR2043	Operating Systems	3	3	
17	SECJ2154	Object Oriented Programming	4	4	
18	SECV3032	Graphics and Multimedia Software Project I	2	2	
19	SECJ3203	Theory of Computer Science	3	3	
20	SECV4118	Industrial Training	8	HL	
21	SECV4114	Industrial Training Report	4	4	
22	SECV4134	Graphics and Multimedia Software Project II	4	4	
23	SCSD3761	Technopreneurship Seminar	1	1	
ELECTIVES COURSES (34 CREDITS) – *Choose SECV3104 and 10 other elective courses from the following list (which can include up to maximum of 4 PRISMS courses, for qualified students)*					
SECV ELECTIVES COURSES					
24	SECV2213	Fundamental of Computer Graphics	3	3	
25	SECJ2363	Software Project Management	3	3	
26	SECV3104	Applications Development	4	4	
27	SECJ3553	Artificial Intelligence	3	3	
28	SECV3113	Geometric Modelling	3	3	
29	SECV3213	Fundamental of Image Processing	3	3	
30	SECJ3263	Mobile Application Programming	3	3	

31	SECV3223	Multimedia Data Processing	3	3	
32	SECJ3563	Computational Intelligence	3	3	
33	SECV3263	Multimedia Web Programming	3	3	
34	SECV3233	Data Visualisation	3	3	
35	SECV3123	Real-time Computer Graphics	3	3	
36	SECV4213	Computer Games Development	3	3	
37	SECV4233	Advanced Computer Graphics	3	3	
38	SECV4273	Introduction to Speech Recognition	3	3	
PRISMS ELECTIVES COURSES					
39	SECR 5033	Information Security Governance and Risk Management	3	3	
40	SECR5043	Cloud Computing Security	3	3	
41	SECJ5013	Secure Software Engineering	3	3	
42	SECR5053	Penetration Testing	3	3	
43	SECJ5023	Advanced Theory of Computer Science	3	3	
44	SECJ5033	Advanced Data Structure and Algorithms	3	3	
45	SECJ5043	Advanced Artificial Intelligence	3	3	
46	SECP5013	Advanced Analytics for Data Science	3	3	
47	SECP5023	Big Data Management	3	3	
48	SECP5033	Business Intelligence and Analytics	3	3	
49	SECP5043	Data Science Governance	3	3	
50	SECP5053	Massive Mining and Streaming	3	3	
51	SECP5063	Statistics for Data Science	3	3	
TOTAL CREDIT OF COMPUTER SCIENCE COURSES (a)			**108**	**100**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
For Malaysian Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	
2	UHMS1182	Penghayatan Etika dan Peradaban	2	2	
For International Students					
1	UHIS1022	Falsafah dan Isu Semasa	2	2	
	UHMS1182	Penghayatan Etika dan Peradaban			
2	UHLM1012	Malaysia Language for Communication	2	2	
Cluster 2: Generic Skills					
1	UBSS1032	Introduction to Entrepreneurship	2	2	
2	UHMT1012	Graduate Success Attributes	2	2	
Cluster 3: Knowledge Enhancement					
1	UHIT2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1	UKQF2xx2	Service-Learning Co-curriculum Elective	2	2	
2	UKQT3001	Extracurricular Experiential Learning	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					

1	UHLB1122	English Communication Skills	2	2	
2	UHLB2122	Academic Communication Skills	2	2	
3	UHLB3132	Professional Communication Skills	2	2	
4	UHLx1112	Foreign Language Elective	2	2	
Other University Electives					
1	Uxxx2xx2	Any 1 course from Cluster 2 or Cluster 3	2	2	
TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)			23	23	
TOTAL CREDIT TO GRADUATE (a + b + c)			131	123	

OTHER COMPULSORY COURSES		
No.	**PSC COURSE**	
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	
2	Talent and Competency Management	
3	English Communication Skills for Graduating Students (ECS)	
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	

COURSE SYNOPSIS

CORE COURSES

SECI1013 - Discrete Structure

This course introduces students to the principles and applications of discrete structure in the field of computer science. The topics that are covered in this course are set theory, proof techniques, relations, functions, recurrence relations, counting methods, graph theory, trees and finite automata. At the end of the course, the students should be able to use set theory, relations and functions to solve computer science problems, analyze and solve problems using recurrence relations and counting methods, apply graph theory and trees in real world problems and use deterministic finite automata finite state machines to model electronic devices and problems.

SECJ1013 - Programming Technique I

As a fundamental subject, this course equips the students with theory and practice on problem solving techniques by using the structured approach. Students are required to develop programs using C++ programming language, in order to solve simple to moderate problems. The course covers the following: pre-processor directives, constants and variables, data types, input and output statements, control structures: sequential, selection and loop, built-in and user-defined functions, single and two-dimensional arrays, file operations, pointers, and structured data types.

SECR1013 - Digital Logic

Digital electronics is the foundation of all microprocessor-based systems found in computers, robots, automobiles, and industrial control systems. This course introduces the students to digital electronics and provides a broad overview of many important concepts, components, and tools. Students will get up-to-date coverage of digital fundamentals-from basic concepts to programmable logic devices. Laboratory experiments provide hands-on experience with the simulator software, actual devices and circuits studied in the classroom.

SECP1513 - Technology & Information System

As a primer subject, this course will introduce students to information systems and technology (IS/IT), as well as its uses in daily life both at home and at work. Various aspects of IS/IT encompassing hardware, software, network, communications, internet, multimedia, graphics and systems applications will be introduced. Students will be equipped with basic skills in handling PC installation and productivity tools via practical work in the labs, which shall comprise a major part of the study. At the end of the course, student should be able to distinguish basic IS/IT component and applications.

SECV1113 - Mathematics for Computer Graphics

The aim of this course is to introduce and develop mathematical skills that underpin the technical aspects of computer graphics application. It will emphasize on matrix, vector, geometry and parametric representation, trigonometry, linear algebra and general concept of Vector Calculus. For further understanding about this subject, a lot of exercises will be given. At the end of the course, students should be able to grasp key concept and uses each of the mathematical concept in computer graphics application.

SECl1143 - Probability & Statistical Data Analysis

This course is designed to introduce some statistical techniques as tools to analyse the data. In the beginning the students will be exposed with various forms of data. The data represented by the different types of variables are derived from different sources; daily and industrial activities. The analysis begins with the data representation visually. The course will also explore some methods of parameter estimation from different distributions. Further data analysis is conducted by introducing the hypothesis testing. Some models are employed to fit groups of data. At the end of course the students should be able to apply some statistical models in analysing data using available software.

SECJ1023 - Programming Technique II

Pre-requisite : SECJ1013 Programming Technique I

This course presents the concept of object orientation and object-oriented programming (OOP) techniques using the C++ programming language. It equips the students with the theory and practice on problem solving techniques using the object oriented approach. It emphasizes on the implementation of the OOP concepts including encapsulations, associations and inheritance. At the end of this course, students should be able to apply the OOP techniques to solve problems.

SECR1033 - Computer Organisation and Architecture

Pre-requisite : SECR1013 Digital Logic

This course was designed to give the understanding of basic concept of computer organization and architecture. Topics covered in this subject will be on computer performance, types of data and the representative, arithmetic manipulation, instruction execution, micro programmable control memory, pipelining, memory, input/output and instruction format. At the end of this course, the student should be able to understand the concept of overall computer component and realize the current technology in computer hardware.

SECD2523 - Database

This course introduces students to the concept of database system and how it is used in daily human life and profession. The focus of the course is to equip students with the knowledge and skills on important steps and techniques used in developing a database, especially in the conceptual and logical database design phase. Among topics covered are database environment, database design, entity relationship diagram, normalization, and structured query language (SQL). Students will be taught to use a database management system (DBMS). Students are required to design and develop the database component of an information system using the learned techniques, DBMS and a development tool. At the end of the course, students should be able to apply the knowledge of designing and developing a good database system.

SECD2613 - System Analysis and Design

The main focus of this course is to provide a practical approach of systems analysis and designing skills for the students using structured methodology. Hence the course enables students to study information system requirements for any system application within an organizational context. The contents are sequentially organized directly from planning,

analysis, designing and implementation phases. From the resulting output of the planning and analysis phase shall enable students to form input, output and interface design. Hence a prototype design can be demonstrated.

SECJ2013 - Data Structure and Algorithm
Pre-requisite : SECJ1023 Programming Technique II
This course emphasis on data structure concepts theoretically and practically with detail algorithms for each of data structure. Students will learn abstract data type concepts using class and apply the concept in the implementation of data structures. Apart from it, student will learn recursive concept as a programming style and algorithm efficiency analysis with Big O notation. Various sorting and searching techniques will be discussed as data structure operations. Analysis of each algorithm will also be explained. Further, students will be exposed to linear data structures such as linked lists, stack and queue. Non-linear data structures such as tree and binary search tree will be discussed. Along the course, students should be able to implement and apply the theory and concepts of data structure in the assignments and mini project which are conducted in group.

SECR2213 - Network Communications
This course will discuss the basic topics of computer network and data communications. Based on TCP/IP Internet protocol stack, the course will apply top down approach. Starts with the important and usage of computer network in commonly applications, the approach will go further detail in the technical aspect in data communication. At the end of this course, students will have an understanding and appreciation of how the network works.

SECV2113 - Human Computer Interaction
This course will introduce students to human-computer interaction theories and design processes. The emphasis will be on applied user experience (UX) design. The course will present an iterative evaluation-centered UX lifecycle and will introduce a broader notion of user experience, including usability, usefulness, and emotional impact. The lifecycle should be viewed as template intended to be instantiated in many different ways to match the constraints of a particular development project. The UX lifecycle activities we will cover include contextual inquiry and analysis, requirements extraction, design-informing models, design thinking, ideation, sketching, conceptual design, and formative evaluation.

SECJ2203 - Software Engineering
This course is designed to give students an introduction to an engineering approach in the development of high quality software systems. It will discuss the important software engineering concepts in the various types of the common software process models. The students will also learn the concepts and techniques used in each software development phase including requirements engineering, software design and software testing. This course will also expose the students to utilizing object-oriented method (e.g. UML) and tools in analyzing and designing the software. At the end of this course, students are expected to be able to appreciate most of the common software engineering concepts and techniques as well as producing various software artifacts, documentations, and deliverables.

SECV2223 - Web Programming

This course is designed to introduce students the fundamental of knowledge, technologies and components for web application developments. The basic topics includes the standard HTML for content creation, CSS for content presentation, JavaScript for client-side logics, PHP for server-side logics and MySQL for database processing. At the end of the course, the students should be able to apply the web base technologies and then implement it all in the creating functional data-centric online system project.

SECR2043 - Operating Systems

Pre-requisite : SECR1033 Computer Organization and Architecture

This course covers introduction to operating systems, which serve as an interface between computer hardware and the user. The operating system is responsible for the management and coordination of processes, sharing of limited resources of the computer. Students will be exposed to the techniques and algorithms that may be applied in designing an operating system. Topics covered include process management, concurrency and synchronization, deadlock, memory management, file management, secondary storage management and I/O management. At the end of the course, the student shall have a clear understanding on the general concepts that underlie of an operating system.

SECJ2154 - Object Oriented Programming

Pre-requisite : SECJ1023 Programming Technique II

This course presents the concepts of object orientation and object-oriented programming techniques using Java programming language. It provides students with a thorough look at the basic constructs of the Java programming language such as its basic data types and operations. It also emphasizes on the use of standard Java APIs that allow students to develop text-based and GUI applications. It will also provide the programming techniques on exception handling and input/output files. At the end of this course, students should be able to use the basic constructs in object-oriented programming and utilize the selected Java APIs.

SECV3032 - Graphics and Multimedia Software Project I

Pre-requisite : SECJ3104 Application Development

This is the initial part of a 2-part Final Year Project that every student must fulfil successfully. Students are introduced to the methodologies of research and application development through a series of lectures. Students are guided through a step-by-step practice to complete the initial stages of proposal, planning and design of a project. Students must also meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their initial work.

SECJ3203 - Theory of Computer Science

Pre-requisite : SECI1013 Discrete Structure
SECJ2013 Data Structure and Algorithm

The goal of this course is to provide students with an understanding of basic concepts in the theory of computation. This course introduces students to formal languages and automata theory. It will emphasize on languages, grammars and abstract machines i.e. Regular Language, Context Free Language, Regular Grammar, Context Free Grammar, Finite

Automata, Push Down Automata and Turing Machine. The course will also provide practice on the acceptability of input string by these machines. At the end of the course, students should be able to apply the theory in constructing these abstract machines and testing them with the right input strings.

SECV4118 - Industrial Training (HW)
Pre-requisite : 92 credits AND CGPA >= 2.0
Industrial Training refers to the placement of a student at an organization for a minimum of 20 weeks to elevate students' knowledge and skills in a specific database profession and at the same time produce graduates who are credible, creative and proficient. This course aims to provide a platform for the students apply their knowledge learned in the university and boost their skills which needed by a profession. It is also intend for the students to gain exposure in every aspect of real career life. The students will be evaluated based on two components; 1) student performance evaluation by organisation supervisor and 2) student performance evaluation by faculty supervisor. The organization supervisor is expected to assess the student performance based on work performance and students personality. The assessment by faculty supervisor more focusing on students' generic skills

SECV4114 - Industrial Training Report
Pre-requisite : 92 credits AND CGPA >= 2.0
Industrial Training Report refers to the placement of a student at an organization for a minimum of 20 weeks to experience and apply their theoretical knowledge in the industrial training. The students will be evaluated based on four components; 1) technical report, 2) oral presentation, 3) log book and 4) ethics. The aim of the technical report is to educate the students in producing related technical report and able to explain a specific detail on the tasks that have been done during the training. Students need to follow specified format in writing the technical report and submit it within the predetermined date. The students are required to present their training achievement to Industrial Training supervisors (organization and supervisor). Students need to fill in the online log book daily for the purpose of close monitoring between the students and supervisors. Student also needs to practice the good ethical values and work conduct throughout the training. The passing mark is 60%.

SECV4134 - Graphics and Multimedia Software Project II
Pre-requisite : SECV3032 Graphics and Multimedia Software Project I
This is the second part of a 2-part Final Year Project that every student must fulfil successfully. In this installation, students are required to execute the next phases of their development plan from Part1. Students are now required to code and integrate the different modules that make up the proposed project. Students will test the developed modules and the final fully-integrated project following software development and research testing practices. Students must meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their final work.

SECD3761 - Technopreneurship Seminar

This 1-credit course will provide module and training for students on how to generate digital income through crowdsourcing platforms and methods. Crowdsourcing is a method to generate online income which the work is offered and implemented digitally in global platforms.

ELECTIVE COURSES

SECV2213 - Fundamental of Computer Graphics

Pre-requisite : SECV1113 Mathematics for Computer Graphics
SECJ1023 Programming Technique II

The course introduces students to the fundamental of computer graphics and its applications. It will emphasize on raster graphics hardware, generation of 2D primitives, 2D and 3D transformations, specification of windows and viewports. Students are required to write 2D/3D application in order to reinforce their understanding. At the end of the course, the student should be able to understand how a computer graphics system works and develop simple graphics application using standard graphics libraries.

SECJ2363 - Software Project Management

This course is designed to provide students with in depth knowledge on software project planning, cost estimation and scheduling, project management tools, factors influencing productivity and success, productivity metrics, analysis of options and risks, software process improvement, software contracts and intellectual property and approaches to maintenance and long term software development. At the end of this course, students should be able to know how to manage a software development lifecycle.

SECV3104 - Applications Development

Pre-requisite : SECJ2203 Software Engineering, SECD2523 Database, SECV2223 Web Programming, SECJ2154 Object Oriented Programming

Application Development is a comprehensive service learning course which requires student to solve a real community problem by developing an application. Students will learn how to practice design thinking, adopting Agile development methodology. This involves an iterative process starting from community engagement, requirement elicitation and analysis, design solution, application construction and iterative verification process. Students are required to do reflection on the outcome of the project. In this course students should be able to develop their soft skills such as leadership, team collaboration, documentation process and communication skill.

SECJ3553 - Artificial Intelligence

Pre-requisite : SECJ2013 Data Structure and Algorithm

This course offers students a new perspective on the study of Artificial Intelligence (AI) concepts. The essential topics and theory of AI are presented, but it also includes practical information on data input and reduction as well as data output (i.e. algorithm usage). In particular, this course emphasizes on theoretical and practical aspects of various search algorithms, knowledge representations, and machine learning methods. The course features practical implementations through assignments undertaken both individually and in groups.

SECV 3113 - Geometric Modelling
Pre-requisite : SECV2213 Fundamental of Computer Graphics
This course is designed for students to understand how geometric objects are modeled. This subject emphasizes on the theory of representations, algorithms, and the underlying theoretical framework, essential to solving geometric problems encountered in modeling a 2D/3D object. Selected advanced research issues, such as mesh generation, shape reconstruction; feature-based modeling, non-manifold geometry, and variation surface modeling are also covered. At the end of the course, the student should be able to apply the knowledge of 3D geometric modeling and write program to produce simple 3D models using standard 3D graphics libraries.

SECV3213 - Fundamental of Image Processing
This course discusses some of the digital image processing techniques and their applications particularly in real life applications. It begins with an understanding of specification and structure of a graphic file format with a special attention to image data extractions procedures. Using the extracted data, the image will be manipulated utilizing some of the most popular image processing techniques, among others: point processing operations; (halftoning and histogram equalization), neighbourhood operations; (convolution, low pass filters, high pass filters, high boost filters, median filter), edge detections, and geometric operations.

SECJ3563 - Computational Intelligence
Pre-requisite : SECJ3553 Artificial Intelligence
The aim of this course is to expose the students to current methods and algorithms utilized in area of computational intelligence. The methods include knowledge representation of vague data and inferences using fuzzy logic, learning using neural network and searching using evolutionary algorithms. Students will be equipped with the theories and the necessary skills to model the domain problems suited to the associated techniques or algorithms. This course will cover the topics on fuzzy logic, neural network and evolutionary algorithms. Hands-on class on how to apply the techniques in solving non-linear problems is also introduced. Conducting a paper review of related journals will expose the students to appreciate the contributions of CI-related techniques in solving real-world problems besides developing academic research writing skill.

SECJ 3623 - Mobile Application Programming
Pre-requisite : SECJ2154 Object-Oriented Programming
This course is designed to give students a foundation on the development of applications for mobile devices. It will cover the workflows, tools and frameworks required to develop applications for current and emerging mobile computing devices. The course will adopt a current technology as a basis for teaching the process of mobile application development. This course will also expose the students to composing user interfaces for mobile, dealing with device resources, integrating with backends and deploying the applications. At the end of the course, students should be able to work collaboratively in developing working data-centric mobile applications.

SECV3223 - Multimedia Data Processing
Pre-requisite : SECJ1023 Programming Technique II
This course will concentrates on using existing frameworks (Java Media Framework, DirectX or MatLab) for processing multimedia data with the main purpose to train the students to produce multimedia data related software & tools. As multimedia comes with many types of data (text, audio, video, and animation) and varieties of formats for presentation and storage, students will be first exposed with the basic ideas and concept behind multimedia data technology. Students are required to understand the theory and techniques for data acquisition, sampling, storage, and presentation. Next, students are exposed with more advance task which involving multimedia data manipulation. At the end of the course students are required to produce their own software/application for multimedia data presentation & manipulation.

SECV3263 - Multimedia Web Programming
Web environment provide a wide selection of technologies and components for online application development. Current available technologies and components are consisting of standard view elements (HTML and CSS), server-side logic (CGI, Servlet. Server Pages Technologies), client-script logic (JavaScript), data communication and interoperability (AJAX, JSON, XML), 2D/3D graphic system (X3DOM, SVG) and various components provided by other proprietary software vendors. This course will expose the students to the concepts and hands-on experiences on how to fully integrate and exploit all of these components into single application to provide full-featured “Rich Internet Application” (RIA) to the clients.

SECV3233 - Data Visualisation
This course presents the theoretical and technical aspects of data visualization in various applications. It emphasises on the process of visualization, which include various data sources, reconstruction of data, data models and data model representation techniques. Real applications of data visualization such as used in medical, scientific, engineering, biotechnology and environment applications are also discussed.

SECV3123 - Real-time Computer Graphics
Pre-requisite : SECV2213 Fundamental of Computer Graphics
This course is to expose students in developing real-time and interactive computer graphics applications. This is an intensive programming subject and students are expected to equip themselves with adequate programming skills. Interactive development such as fast polygon rendering algorithm with level-of detail, scene management, dynamic camera manipulation, real-time shading and rendering and physical simulation will be covered and integrated in the application. Throughout the course, students will design and develop a real-time computer graphics application. At the end of this course, student should be able to acquire the theory and practice of real-time computer graphics.

SECV4213 - Computer Games Development

Pre-requisite : SECV3123 Real Time Computer Graphics

This course introduces and equips student to the process of developing Computer Games including fundamental theory such as Game Design and Game Programming. The game design provides students with basic skills to design games such as genre-specific, storytelling, level design and project lifecycle and documents. The game programming emphasizes on the development of games using game engine such as Unity3D, or any other latest game engine technology employed in developing games.

SECV4543 - Advanced Computer Graphics

Pre-requisite : SECV2213 Fundamental of Computer Graphics Student is expected to have basic knowledge about 3D modelling and rendering techniques. Topics covered include 3D transformation, viewing, projection, 3D Clipping, viewport transformation. Lighting, shading, visible surface detection, adding realism through textures, ray casting, ray tracing and radiosity are also covered. At the end of the course, the students should be able to apply the rendering and lighting algorithms and then implement the algorithms in the creation of a 3D graphics project.

SECV4273 - Introduction to Speech Recognition

Pre-requisite : SECJ1023 Programming Technique II

This course aims to provide theoretical foundations and practical experience in computer speech processing and recognition. Many of the techniques and algorithms covered under the course are applicable to a variety of areas concerned with recognizing sequences. On completion of the course, students should be able to understand the basic principles of pattern recognition, gain knowledge of automatic speech recognition (ASR) system design, and the various trade-offs involved. It should also enable students to read and discuss technical papers in ASR, speech processing and pattern recognition.

INTEGRATED BACHELOR-MASTER PROGRAMME (PRISMS) ELECTIVE COURSES

LIST of PRISMS ELECTIVE COURSES

1. **Master of Science (Information Security)/ Master of Cyber Security**

- SSCR/SECR 5013 Cryptographic Engineering
- SSCR SECR5023 Digital Forensics
- SSCR/SECR 5033 Information Security Governance and Risk Management
- SSCR/SECR 5043 Cloud Computing Security
- SCSJ/SECJ 5013 Secure Software Engineering
- SECR 5053 Penetration Testing

2. **Master of Computer Science,** by mixed mode

- SCSJ/ SECJ 5023 Advanced Theory of Computer Science
- SCSJ/ SECJ 5033 Advanced Data Structure and Algorithms
- SCSJ/ SECJ 5043 Advanced Artificial Intelligence

3. **Master of Science (Data Science)**

- SCSP/SECP 5013 Advanced Analytics for Data Science
- SCSP/SECP 5023 Big Data Management
- SCSP/SECP 5033 Business Intelligence and Analytics
- SCSP/SECP 5043 Data Science Governance
- SCSP/SECP 5053 Massive Mining and Streaming
- SCSP/SECP 5063 Statistics for Data Science

PRISMS ELECTIVE COURSE SYNOPSIS

1. Master of Cyber Security

SECR5013 - Cryptographic Engineering
Pre-requisite: SECR3443 Introduction to Cryptography
This subject is a continuation from the introductory cryptography. All networked computers and devices must have cryptographic layers implemented and must be able to access to cryptographic functions in order to provide security features. In this context, efficient (in terms of time, area, and power consumption) hardware and software structures will have to be designed, implemented, and deployed. Discussion and analysis on how to resist cryptanalytic attacks by protecting access to primary (communication) and secondary (power, electromagnetic, acoustic) channels. Learn the algorithms, methods, and techniques in order to create latest cryptographic embedded software and hardware using common platforms and technologies. In addition to that, Ethical issues in Cryptography is discuss.

SECR5023 - Digital Forensics
Pre-requisite: SECR3413 Computer Security
This course takes a detailed approach to the use of computers and computer technology in the investigation of incidents, both criminal and civil, in which computer technology play a significant or interesting role. Students completing this course will be familiar with the core

computer science theory and practical skills necessary to perform elementary computer/digital forensic investigations, understand the role of technology in investigating computer based crime, and be prepared to deal with investigative bodies at an elementary level.

SECR5033 - Information Security Governance and Risk Management
Pre-requisite: SECR3413 Computer Security
The course is aimed at imparting knowledge and skill sets required to assume the overall responsibilities of administration and management of security of an information system. This course covers issues related to administration, management and governance of security of information systems. Topics include auditing and data management, risk management (risk identification, risk analysis, risk control), contingency planning, incident handling and risk governance. The course will study in detail principles and tools related to these topics. The course will also cover security standards, evaluation and certification process, security planning, ethical and legal issues in information and privacy.

SECR5043 - Cloud Computing Security
Pre-requisite: SECR1213 Network Communications
SECR3413 Computer Security
In this course, we are going to learn about common cloud misconfigurations, how to perform a risk assessment and verify compliance for various Cloud Services. Further, we will delve deeper into identifying security risks in these cloud services and to implement best practices to mitigate the common cloud misconfigurations. Other topics include topics of data ownership, privacy protections, data mobility, quality of service and service levels, bandwidth costs, data protection, and support.

SECR5053 - Penetration Testing
Pre-requisite: SECR2043 Operating System
SECR3413 Computer Security
This course will discuss issues pertaining to penetration testing which covers areas like finding vulnerabilities in various computer systems, exploiting them in an ethical manner. Emphasis is given on the fundamental theory and as well as hands on practice. Topics covered include information reconnaissance, web application pentesting, wireless pentesting, network pentesting, and current issues in pentesting.

SECJ5013 - Secure Software Engineering
This course provides the principles of Secure Software Engineering and practical methods to secure requirements, design, implementation, testing, deployment and maintenance in software development. Students will also review policy specific requirements necessary to implement a secure development program within enterprise organizations. The students will also be able to understand software vulnerability, and how to evaluate, and address security risks to software.

2. Master of Computer Science, by mixed mode

SECJ5023 - Advanced Theory of Computer Science

The course presents the most fundamental theories and concepts that provide a mathematical sense to answer some of the basic question as can the given problems be solved by computation and how efficiently can a given problem be solved by computation. The course provides an in-depth study to the main models and concepts of the mathematical theory of computation, including automata and languages, computability and complexity. The emphasis of the course will be on the ability to move from a concrete problem to a mathematical model, and after proving things about the mathematical model to correctly interpret what we have learned about the concrete problem.

SECJ5033 - Advanced Data Structure and Algorithms

This course provides a solid or advanced understanding to theory and practice of data structure and the study of algorithms analysis. Students will learn the most common data structures and the advanced concepts of the data structure such as B-trees, heaps and priority queues. Further, students will be exposed to the techniques used in the development and analysis of data structures and its algorithms. The analytical abilities of the students in this course are to analyze the performance of data structures and algorithms. At the end of the course, students should be able to implement and apply the theory and concepts of the advanced data structure in assignments.

SECJ5043 - Advanced Artificial Intelligence

Increasing practical implementation of several Soft Computing approaches in real world problems has grounded this course to explore the intensity of SC techniques. As such, Neural Computing, Nature Inspired Computing and Granular Computing provide foundations for the conception, design and development of the intelligent systems. By hybridizing such paradigms, it has been possible to create a number of successful and sophisticated solutions to complex real-world problems. The aim of this course is to provide the student with knowledge of the principles, mechanisms and theory behind SC and their applications. The theory of each SC techniques is given in a conceptual and in a mathematical way; the practice is discussed with stress on the outcomes of successful applications and on the intricacies of the actual implementations.

3. Master of Science (Data Science)

SECP5013 - Advanced Analytics for Data Science

This course provides a solid or advanced understanding on the use of analytics approach in the examination of data or content to discover deeper insights, make predictions or generate recommendations using sophisticated techniques and tools on real world problems. Students will learn descriptive analytics using advance tools to gain insight into the past. Students will also acquire understanding of predictive analytics using statistical and machine learning techniques to understand future outcome. The prescriptive analytics provides knowledge in simulation and optimization to quantify the effect of future decision to advise possible outcomes before decision is made. The analytical abilities to be acquired by students in this course are to reliably select analytic techniques or method and specify steps involve in the

analysis process and to interpret analytically the results obtained from data analytics techniques or tools. At the end of the course, students should be able to implement and apply the knowledge on analytical techniques or tools in real world problems and able to make an informed decisions or recommendation through analytical interpretations of results.

SECP5023 - Big Data Management

This course provides a basic fundamental of big data architecture and management.Students will learn the big data processes and the current big data technologies that are available. Further, students will be exposed to the big data platform ecosystem for big data manipulation. The big data management will be explored for the best practice in managing and manipulating large amount of data. At the end of the course, students should be able to understand the architecture and management of big data and also can develop simple application of big data handling using particular platform in assignment.

SECP5033 - Business Intelligence and Analytics

Business analytics refers to the ways in which enterprises such as businesses, non-profits and governments can use data to gain insights and make better decisions. Business analytics is applied in operations, marketing, finance and strategic planning among other functions. The ability to use data effectively to drive rapid, precise and profitable decision has been critical strategic advantages for companies. With the increasing availability of broad and deep sources of information-so called “Big data”- business analytics are becoming an even more critical capability for enterprises of all types and all sizes. It combines statistical analysis and predictive modeling to identify trends and understand the information that can drive business change and support sustained successful business practices.

SECP5043 - Data Science Governance

Data governance is a mandatory requirement for a successful organization which aims to achieve master data management, build business intelligence, improve data quality or manage documents. This course provides an overview of the data governance lifecycle. Students will learn why data governance is needed, how to design, initiate, and execute a program and how to keep the program sustainable. The big data management will be explored for the best practice in managing and manipulating large amount of data. At the end of the course, students should be able to understand the management and governance of big data.

SECP5053 - Massive Mining and Streaming

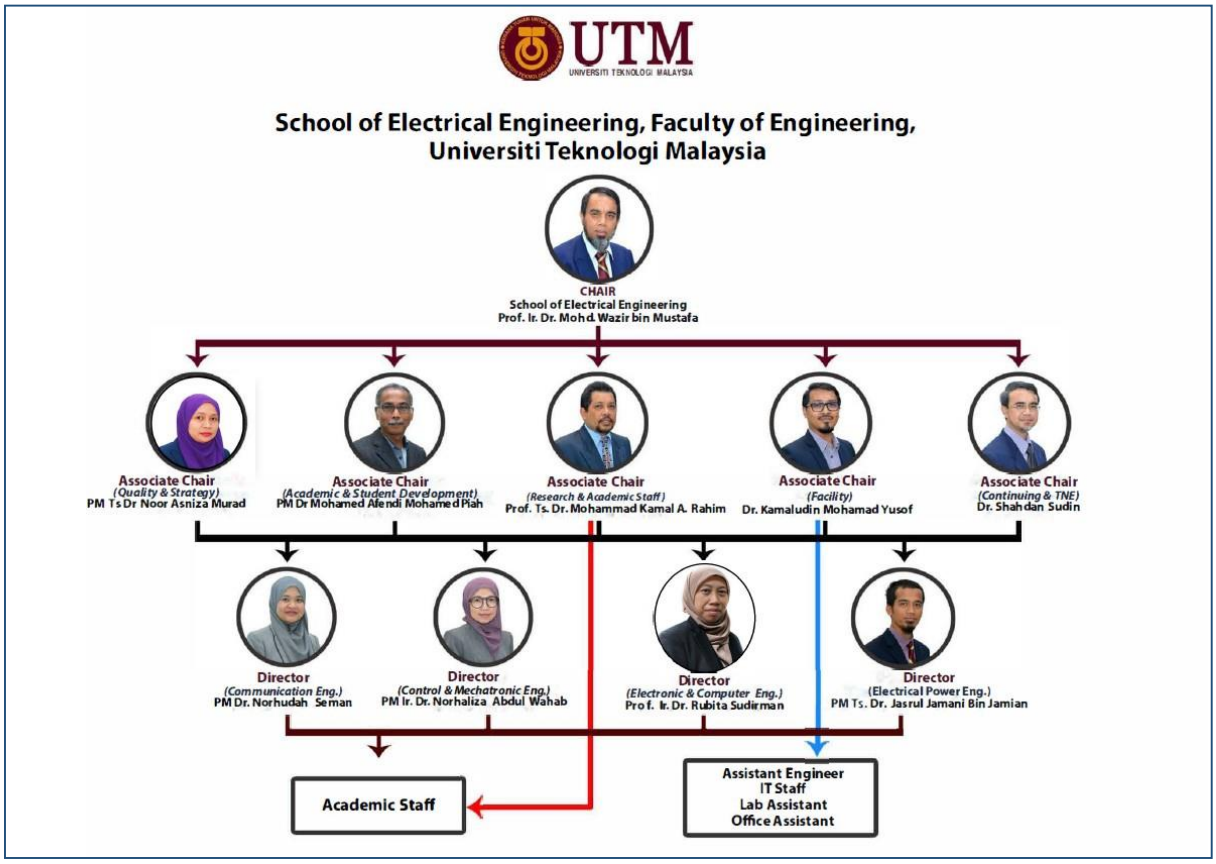
This course aims to introduce students to basic principles and methods of machine learning algorithms that are typically used for mining large data sets. This course also will provide students with the skill and knowledge to build system and capable of analyzing huge amount of data. It explains the principle of distributed file systems and shows map reduce as a tool for creating parallel algorithms. Typically, it covers the algorithms that used for analyzing networks, fundamental principles of techniques such as decision trees and support vector machines and finally neural network architecture. The students will gain practical understanding through a coding exercise where they will implement and apply one machine learning algorithm on a particular large dataset.

SECP5063 - Statistics for Data Science

This course provides a fundamental concept in statistics for data science. Students will learn statistical inference including estimation, hypothesis testing and nonparametric tests. Further, students will be introduced to Bayesian inference, linear regression and classification. R will be used to apply these statistical methods. At the end of the course, students should be able to apply the statistical methods to real large data sets.

SCHOOL OF ELECTRICAL ENGINEERING

MANAGEMENT TEAM



Position	Name
Chair	Prof. Ir. Dr. Mohd Wazir bin Mustafa wazir@utm.my 07-5535200
Associate Chair (Academic and Student Development)	Associate Prof. Dr. Mohamed Afendi bin Mohamed Piah fendi@utm.my 07-5557011
Associate Chair (Research and Academic Staff)	Prof. Dr. Mohamad Kamal bin A. Rahim mdkamal@utm.my 07-5557012
Associate Chair (Quality and Strategy)	PM Ts Dr Noor Asniza Murad noorasniza@utm.my 07-5557020
Associate Chair (Facility)	Dr. Kamaludin bin Mohamad Yusof kamalmy@utm.my 07-5557194
Associate Chair (Continuing and Transnational Education)	Dr. Shahdan bin Sudin shahdan@utm.my 07-5557022

Director (Communication Engineering)	Associate Prof. Dr. Norhudah binti Seman norhudah@utm.my 07-5557017
Director (Control & Mechatronics Engineering)	Assoc. Prof. Ir. Dr. Norhaliza binti Haji Abd Wahab norhaliza@utm.my 07-5557023
Director (Electronic & Computer Engineering)	Assoc. Prof. Ir. Dr. Rubita Sudirman rubita@utm.my 07-5557193
Director (Electrical Power Engineering)	Dr. Jasrul Jamani bin Jamian jasrul@utm.my 07-5557019

BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Electrical Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Electrical Engineering with Honours	
4. Final Award			Bachelor of Electrical Engineering with Honours	
5. Programme Code			SEEEH	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study (Conventional, distance learning, etc)			Conventional	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum : 4 yrs Maximum : 6 yrs	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	18	-
Short	4	-	10	-

Course Classification

Bachelor of Electrical Engineering with Honours - SEEEH

No.	Classification	Credit Hours	Percentage
i.	University Courses a. General b. Language c. Entrepreneurship d. Co-Curriculum	 23 8 2 3	26.3%
ii.	School/Programme Core	86	62.8%
iii.	Programme Electives	15	10.9%
	Total	**137**	**100%**
A	Engineering Courses a) Lecture/Project/Laboratory b) Workshop/Field/Design Studio c) Industrial Training d) Final Year Project	 89 - 6 6	73.7%
	Total Credit Hours for Part A	**101**	
B	Related Courses a) Applied Science/Mathematic/Computer b) Management/Law/Humanities/Ethics/Economy c) Language d) Co-Curriculum	 15 10 8 3	26.3%
	Total Credit Hours for Part B	**36**	
	Total Credit Hours for Part A and B	**137**	100%
	Total Credit Hours to Graduate	**137 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 137 credit hours (SEEE) with a minimum CGPA of 2.0.
- Complete Professional Skills Certificates (PSC).

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Become Electrical Engineers who are competent, innovative, and productive in addressing customer needs.
PEO2	Grow professionally with proficient soft skills.
PEO3	Demonstrate high standards of ethical conduct, positive attitude, and societal responsibilities.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Ability to apply knowledge of mathematics, science and electrical engineering to the solution of complex engineering problems.
PLO2	Ability to perform research-based analysis, conduct experiments and interpret data for complex engineering problems.
PLO3	Ability to identify, formulate, conduct research literature to analyse complex engineering problems using engineering knowledge.
PLO4	Ability to apply engineering practice and use modern engineering, and IT tools for complex engineering problem with an understanding the limitations of the technology.
PLO5	Ability to design solutions for complex engineering problems and design systems and processes that meet specified needs with appropriate consideration for public health and safety, culture, society, and environment.
PLO6	Ability to articulate ideas, communicate effectively, in writing and verbally, on complex engineering activities with the engineering community and with society at large.
PLO7	Ability to function effectively as an individual, as a member or as a leader in diverse teams.
PLO8	Ability to recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PLO9	Ability to comprehend the impact of global and contemporary issues, the role of engineers on society including, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practices and engineering problems.
PLO10	Ability to comprehend and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts.
PLO11	Ability to grasp and execute responsibility professionally and ethically in professional engineering practices.
PLO12	Ability to demonstrate knowledge and understanding of engineering and management principles, and economic decision-making to manage projects in multidisciplinary environments.

PROFESSIONAL SKILLS CERTIFICATE (PSC)

New PSC courses are introduced to new and current students starting from Session 2020/2021. Students are required to undertake and pass Five (5) Professional Skills Certificate (PSC) courses of UTM Institute for Life Ready Graduate (UTM ILeague). These courses are offered and managed by School of Professional and Continuing Education (SPACE) in collaboration with Schools or Faculties. Students are required to register the courses through SPACE Website.

List of PSC courses are as follows:

No.	PSC COURSE	OFFERED AND MANAGED BY SPACE IN COLLABORATION WITH
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	UTM Excite
2	Talent and Competency Management	UTM Career Centre (UTMCC)
3	English Communication Skills for Graduating Students (ECS)	Language Academy
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	Faculty of Engineering (FE)
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	Schools or Faculties at UTM

COURSE MENU

Bachelor of Electrical Engineering with Honours - SEEEH

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 1012	Introduction to Electrical Engineering	2	
SEEE 1013	Electrical Circuit Analysis	3	
SECP 1103	C Programming Techniques	3	
SSCE 1693	Engineering Mathematics I	3	
UHLB 1112	English Communication Skills	2	
UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students)		
	TOTAL CREDIT	**15**	
	CUMULATIVE CREDITS	**15**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 1022	Introduction to Scientific Programming	2	
SEEE 1073	Electronic Devices and Circuits	3	SEEE 1013
SEEE 1223	Digital Electronics	3	
SEMU 2113	Engineering Science	3	
SSCE 1793	Differential Equations	3	
UHIS 1022	Philosophy and Current Issues (for Local Students)	2	
UHLM 1012	Malay Language for Communication 2 (International Students)		
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**31**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 2073	Signals and Systems	3	
SEEE 2133	Electronic Instrumentation and Measurement	3	
SEEE 2423	Fundamentals of Electrical Power Systems	3	SEEE 1013
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UHMT 1012	Graduate Success Attribute	2	
UHLB 2122	Academic Communication Skills	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**47**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 2263	Digital Systems	3	SEEE 1223
SEEE 2523	Electromagnetic Field Theory	3	SSCE 1993
SEEE 2742	2nd Year Electronic Design Laboratory	2	
SSCE 2193	Engineering Statistics	3	
UBSS 1032	Introduction to Entrepreneurship	2	
UHLB 3132	Professional Communication Skills	2	
UKQF 2**2	Elective of Co-Curricular Service Learning	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**64**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3133	System Modeling and Analysis	3	SEEE 2073
SEEE 3223	Microprocessor	3	SEEE 1223
SEEE 3533	Communication Principles	3	SEEE 2073
SEEE 3732	Common 3rd Year Laboratory	2	
SEEE 4443	Power System Analysis	3	SEEE 2423
SSCE 2393	Numerical Methods	3	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**81**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3143	Control System Design	3	SEEE 3133
SEEE 3742	Specialized 3rd Year Laboratory	2	
SEEE 4423	Power System Engineering	3	SEEE 4443
SEEE 4433	Power Electronics and Drives	3	SEEE 2423
SEEE 4463	High Voltage Technology	3	SEEE 4443
UHL* 1112	Elective of Foreign Language	2	
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**98**	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4926	Practical Training	6	
	TOTAL CREDIT	6	
	CUMULATIVE CREDITS	104	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SHMS 4542	Engineering Management	2	
SEEE 4633	Electrical Machines	3	SEEE 2423
SEEE 4723	Capstone Project	3	
SEEE 4812	Final Year Project Part I	2	
SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	
SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**120**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4012	Professional Engineering Practice	2	
SEEE 4824	Final Year Project Part II	4	SEEE 4812
SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	
SEE* 4**3 / SEE*5**3	Field Elective 4 / PRISMS Elective 4	3	
SEE* 4**3	Field Elective 5	3	
UHIT 2302	Science and Technology Thinking	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**137**	

FIELD ELECTIVES- POWER ENGINEERING			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4453	Power System Control	3	SEEE 4423
SEEE 4613	High Voltage Testing and Calibration	3	SEEE 4463
SEEE 4643	Control and Design of Power Electronic System	3	SEEE 4433
SEEE 4653	Photovoltaic and Wind Energy Systems	3	SEEE 4433
SEEE 4663	Electricity for Sustainable Energy	3	SEEE 4423
SEEE 4673	Electricity Market (Electrical Energy Market)	3	SEEE 4443
SEEE 4683	Power System Design and Operation	3	SEEE 4443

FIELD ELECTIVES- CONTROL ENGINEERING			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4113	Modern Control Theory	3	SEEE 3143
SEEE 4153	Digital Control Systems	3	SEEE 3143
SEEE 4173	Industrial Process Control	3	SEEE 3143
SEEI 3133	Industrial Instrumentations and Applications	3	SEEE 2133
SEEI 4173	Advanced Transducers and Sensors	3	SEEI 3133
SEEI 4313	PLC and SCADA System Design	3	SEEE 3143
SEEI 4363	Industrial Control Network	3	SEEE 3143
SEEM 4173	Artificial Intelligence	3	

FIELD ELECTIVES- ELECTRONIC ENGINEERING			
Code	**Course**	**Credit**	**Pre-requisite**
SEEL 3613	Semiconductor Materials Engineering	3	SEEE 1073
SEEE 3263	Electronic System	3	SEEE 1073
SEEL 4223	Digital Signal Processing 1	3	SEEE 2073
SEEL 4273	CAD with HDL	3	SEEE 2263
SEEL 4283	Analog CMOS IC Design	3	SEEE 1073
SEEL 4373	IC Testing Techniques	3	SEEE 2263 SEEL 4283
SEEL 4743	Basic Digital VLSI Design	3	SEEE 2263

FIELD ELECTIVES- COMMUNICATION ENGINEERING			
Code	**Course**	**Credit**	**Pre-requisite**
SEET 3573	Microwave Engineering	3	SEEE 3533
SEET 3583	Digital Communication Systems	3	SEEE 3533
SEET 3623	Data Communication and Networks	3	SEEE 3533
SEET 4523	Optical Communication Systems	3	SEEE 3533
SEET 4533	Wireless Communication Systems	3	SEET 3573
SEET 4543	RF Microwave Circuit Design	3	SEET 3573
SEET 4593	Acoustic Engineering	3	SEEE 3533
SEET 4613	Antenna Theory and Design	3	SEET 3573
SEET 4623	Network Programming	3	SEET 3623

SEEE Elective Courses for PRISM (CHOOSE MAXIMUM 4)			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 5533	Power Electronics Systems	3	
SEEE 5583	High Voltage and Electrical Insulation	3	
SEEE 5603	Power System Analysis and Computational Method	3	
SEEE 5633	Power System Devices and Apparatus	3	
SEEL 5123	Advanced Microprocessor System	3	
SEEL 5173	Advanced Digital System Design	3	
SEET 5313	Communications and Computer Networks	3	
SEET 5413	Advanced Digital Communication	3	
SEEL 5113	Advanced Nanoelectronics Devices	3	
SEEL 5193	Advanced Analog CMOS IC Design	3	

SEEE Elective Courses for PRISM (CHOOSE MAXIMUM 4)			
Code	**Course**	**Credit**	**Pre-requisite**
SEEM 5753	Advanced Instrumentation and Measurement	3	
SEEM 5713	Artificial Intelligence and Applications	3	
SEEM 5703	Control Systems Engineering	3	
SEET 5313	Communications and Computer Networks	3	
SEET 5513	Sustainable Design, Engineering and Management	3	
SEET 5423	Wireless Communication Systems	3	
SEET 5523	Internet of Things Technology	3	

PRISMS ELECTIVE COURSES

For students who intend to enroll into PRISMS programme, refer to the PRISMS Section for a list of related elective courses associated with the postgraduate programmes.

Requirements

Students who are eligible to apply for PRISMS are those with academic qualification who are in Year 3 Semester 2 with cumulative average grade value of CGPA 3.3 and above. Students can apply for PRISMS in Year 3 Semester 2 through the Program Integrasi Sarjana Muda-Sarjana (PRISMS) application form and must be recommended by the Academic Advisor, approved by the Program Director and certified by the Chair of School or Dean of Faculty.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

Bachelor of Electrical Engineering with Honours - SEEEH

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√)IF PASSED
BACHELOR OF ENGINEERING (ELECTRICAL)					
1.	SEEE 1012	Introduction to Electrical Engineering	2	2	
2.	SEEE 1013	Electrical Circuit Analysis	3	3	
3.	SEEE 1022	Introduction to Scientific Programming	2	2	
4.	SEEE 1073	Electronic Devices and Circuits	3	3	
5.	SEEE 1223	Digital Electronics	3	3	
6.	SEEE 2073	Signals and Systems	3	3	
7.	SEEE 2133	Electronic Instrumentation & Measurement	3	3	
8.	SEEE 2263	Digital Systems	3	3	
9.	SEEE 2423	Fundamentals of Electrical Power Systems	3	3	
10.	SEEE 2523	Electromagnetic Field Theory	3	3	
11.	SEEE 2742	2nd Year Electronic Design Lab	2	2	
12.	SEEE 3133	System Modeling & Analysis	3	3	
13.	SEEE 3143	Control System Design	3	3	
14.	SEEE 3223	Microprocessor	3	3	
15.	SKEE 3533	Communication Principles	3	3	
16.	SEEE 3732	Common 3rd Year Laboratory	2	2	
17.	SEEE 3742	Specialized 3rd Year Laboratory	2	2	

18.	SEEE 4012	Professional Engineering Practice	2	2	
19.	SEEE 4423	Power System Engineering	3	3	
20.	SEEE 4433	Power Electronics and Drives	3	3	
21.	SEEE 4443	Power System Analysis	3	3	
22.	SEEE 4463	High Voltage Technology	3	3	
23.	SEEE 4633	Electrical Machines	3	3	
24.	SEEE 4723	Capstone Project	3	3	
25.	SEEE 4812	Final Year Project Part I	2	2	
26.	SEEE 4824	Final Year Project Part II	4	4	
27.	SEEE 4926	Practical Training	6	6	
28.	SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	3	
29.	SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	3	
30.	SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	3	
31.	SEE* 4**3 / SEE*5**3	Field Elective 4 / PRISMS Elective 4	3	3	
32.	SEE* 4**3	Field Elective 5	3	3	
33.	SECP 1103	C Programming Techniques	3	3	
34.	SEMU 2113	Engineering Science	3	3	
35.	SHMS 4542	Engineering Management	2	2	
		TOTAL CREDIT OF ENGINEERING COURSES(a)	**101**	**95**	
MATHEMATICS COURSES (Faculty of Science)					
1.	SSCE 1693	Engineering Mathematics I	3	3	
2.	SSCE 1793	Differential Equations	3	3	
3.	SSCE 1993	Engineering Mathematics II	3	3	

4.	SSCE 2193	Engineering Statistics	3	3	
5.	SSCE 2393	Numerical Methods	3	3	
		TOTAL CREDIT OF MATHEMATICS COURSES (b)	**15**	**15**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1.	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			
2.	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
Cluster 2: Generic Skills					
1.	UHMT 1012	Graduate Success Attributes	2	2	
2.	UBSS 1032	Introduction to Entrepreneurship	2	2	
Cluster 3: Knowledge Enhancement					
1.	UHIT 2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1.	UKQF 2**2	Elective of Co-Curricular Service Learning	2	2	
2.	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1.	UHLB 1112	English Communication Skills	2	2	
2.	UHLB 2122	Academic Communication Skills	2	2	
3.	UHLB 3132	Professional Communication Skills	2	2	

4.	UHL* 1112	Elective Of Foreign Language	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**21**	**21**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**137**	**131**	
OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC). • **Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.** • **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**					
COMPULSORY PSC COURSES (Enroll all 4 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	Faculty Engineering Safety Pass (FESP) *MODULE 1 - compulsory for SKM, SKT and SKE students* *MODULE 2 – compulsory for SKA, SC, SKBSK students*			
4	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
ELECTIVE PSC COURSE (Choose 1 only)					
1	GSPX XXXX	Data Analytics for Organization			
2	GSPX XXXX	Writing			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical Works)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	More elective courses to be added in future			

COURSE SYNOPSIS

SEEE 1012 : INTRODUCTION TO ELECTRICAL ENGINEERING

This course serves as a general introduction to electrical engineering programmes offered by the School of Electrical Engineering (SEE), Universiti Teknologi Malaysia (UTM). Students undertaking this course will be exposed to attributes of electrical engineers from both academic and practical points of view. Soft skills and knowledge that are necessary in the engineering world will be introduced to the students. The students will have a clearer understanding on the responsibilities of electrical engineers to the society. By exploring contemporary issues, the students would be able to suggest sustainable solutions to the mankind and its environment.

SEEE 1013 - Electrical Circuit Analysis

This course introduces students to the basic laws, methods of analysis and theorems for direct current, DC and alternating current, AC circuit, such as, Ohms Law, Kirchhoff's Current and Voltage Laws, Mesh and Nodal Analysis and Thevenin's and Norton's Theorems. Based on these, the students are expected to be able to solve for variables in any given DC and AC electric circuits. The students also exposed to the steady-state electrical circuit. Afterwards, the relevant concepts in transient circuit analysis for first and second order circuit are taught to the students. With the knowledge learned, the student would be able to apply the basic laws, theorem and methods of analysis for solving completely with confidence various problems in circuit analysis.

SEEE 1022 - Introduction to Scientific Programming

This course introduces the fundamentals of scientific programming languages and techniques used by engineers to solve engineering problems. Students will be introduced to common scientific programming languages and their comparative advantages and disadvantages. Emphasis is placed on fundamentals of programming, program design, verification and visualization. The goal is to provide the students with the skills in scientific computing, tools, techniques that can be used to solve their own engineering problems. Students will learn to implement algorithms using high level programming language (e.g. MATLAB, Mathematica, FORTRAN). The programming skills acquired in this course will allow students to go beyond what is available in pre-packaged analysis tools, and code their own custom data processing, analysis and visualization for any engineering problem.

SEEE 1073 - Electronic Devices & Circuits

Pre-requisite: SEEE 1013 Electrical Circuit Analysis

This course provides introduction to the basic operating principles and applications of discrete electronic devices and circuits. The course content starts with the fundamental solid-state principles and continues the discussions with the constructions and characteristics of diode, Bipolar Junction Transistor (BJT) and Enhancement Metal Oxide

Semiconductor Field Effect Transistor (E-MOSFET). The application of diodes focuses on the basic power supply circuits whereas the applications of the transistors focus on the small-signal amplifier. The course content ends with an introduction to the operating principles of an ideal operational amplifier (op-amp) and discussion about op-amp circuits, performance and applications. To help the students understand the behaviour of the electronic devices and predict the behaviour of the electronic circuits, this course makes use of Multisim simulation software. The goal of this course is to develop excellent understanding of the devices operation for students to be applied in analogue and digital circuit design.

SEEE 1223 - Digital Electronics

This course teaches the fundamental principles of digital systems. From the signal concepts and the importance of numbers systems and codes, it then proceeds to logic gates, their relationship to Boolean algebra and the integration of gates to form complex circuits. The course emphasizes on techniques to design, analyse, plan, and implement simple digital systems using gates and MSI circuits. Simulation software Quartus II version 13 will also be introduced to facilitate learning process.

SEEE 2073 - Signals and Systems

This course introduces the students the fundamental ideas of signals and system analysis. The signal representations in both time and frequency domains and their effects on systems will be explored. Specifically, the topics covered in the course include basic properties of continuous-time and discrete-time signals, the processing of signals by linear time-invariant (LTI) systems, Fourier series, Fourier and Laplace transforms. Important concepts such as impulse response, frequency response and system transfer functions as well as techniques of filtering and filter design, modulation, and sampling, are discussed and illustrated. This course will serve as a central building block for students in studying information processing in many engineering fields such as control systems, digital signal processing, communications, circuit design, etc.

SEEE 2133 - Electronic Instrumentation and Measurement

This course introduces students some of the metrological terminologies used in experimental methods, concept of metrology and its application. The course will also provide understanding the concept electrical measurement quantity using analogue and digital instruments. The interfaces of the instruments with embedded sensors and also the quality of the signals acquired are introduced. Besides that, this course also introduces the type of electrical noise and the ways to reduce noise and interference. Finally, the fundamental principle of transducers, transducer operations, characteristic and functions will be discussed. P&ID diagram also introduces to cover the basic process of the system.

SEEE 2263 - Digital Systems

Pre-requisite: SEEE 1223 Digital Electronics

This course is a continuation from basic digital logic techniques course. The objective of the course is to introduce students to basic techniques to design and implement complex digital systems It emphasizes on techniques to design, analyse, plan, and implement complex digital systems using programmable logic. To facilitate learning process, computer-aided design (CAD) software is used throughout the course. Actual environment problems and solutions are provided.

SEEE 2423 - Fundamentals of Electrical Power Systems

Pre-requisite: SEEE 1013 Electrical Circuit Analysis

This course introduces fundamental concepts of electric machines and power system. Students should be able to identify components of the system from the course and describe their basic operations from the course having electromagnetic and circuit concepts learned in previous fundamental courses. These fundamental concepts are further elaborated in applications of electric machines - transformers, direct current machines, synchronous machines and induction machines, power in ac circuits, three-phase system, power system component modeling and analysis. At the end of the course, the students are expected to critically analyze the power system comprising of generation, transmission, and distribution components.

SEEE 2523 - Electromagnetic Field Theory
Pre-requisite: SSCE 1993 Engineering Mathematics 2
This course introduces students to some major views and theories in the area of electrostatic, magnetostatic and electromagnetic fields. This elementary electromagnetic field theory is summarized in Maxwell's equations. It is assumed that students already have appropriate mathematical background including multivariable calculus and some familiarity with the basic concepts typically covered in an introductory circuit theory course such as resistance, capacitance and inductance.

SEEE 2742 - 2nd Year Electronic Design Laboratory
All students will attend three second year laboratories which are the Electrotechnic, Basic Electronic and Digital Electronic Labs. The students will attend a three hour lab per week. The students are expected to complete four experiment topics for each lab in a direct of four week duration. Thus, the student will perform altogether 12 experiments in a semester. All experiments in the laboratories are emphasized on design case for a given complex engineering problem or project. The students will use software simulation tools to assist in their design tasks.

SEEE 3133 - System Modeling and Analysis
Pre-requisite: SEEE 2073 Signals & Systems
This course introduces the students to the fundamental ideas and definitions of control systems, open loop and close loop control systems, transfer functions and transient and steady state responses. Students will be taught how to obtain mathematical models of actual physical systems such as electrical, mechanical and electromechanical systems in the transfer function form. Methods of system representation such as block diagram representation and signal flow graphs will be discussed. The students will also be exposed to techniques of analysing control systems performance and stability in time and frequency domains. Finally, an introduction to the design and analysis of control systems using MATLAB will also be given.

SEEE 3143 - Control System Design
Pre-requisite: SEEE 3133 System Modeling and Analysis
The course begins with the root locus designs using root locus procedures and MATLAB. Then, PID controller will be designed using root locus approach. The PID controller and lead-lag compensator will be used to improve the transient and steady state performances in time domain using root locus approach. In frequency domain approach, the Bode plot method will be utilised. The lead, lag and lead-lag compensators are used in improving the performance of the control system using the frequency domain approach. Finally, applications of control engineering in various fields will be studied.

SEEE 3223 - Microprocessor
Pre-requisite: SEEE 1223 Digital Electronics
This course introduces the principles and applications of microprocessors. Topics emphasized are processor architecture, assembly and HLL language and fundamentals of interfacing in a microprocessor-based embedded system. This course emphasizes on the understanding the fundamentals of microprocessor operation, writing coherent and error-free assembly and HLL language programs, and designing basic interfacing circuits. With the knowledge learned, the

student would be able to design microprocessor-based systems using assembly language and HLL programs completely with confidence.

SEEE 3263 - Electronic Systems
Pre-requisite: SEEE 1073 Electronic Devices and Circuits
This course covers some topics in functional electronic circuits. The circuits are derived from a diverse electronic circuitry that exists in many electronic instrumentation. The function, the behaviour and the characteristics of the functional circuits are analysed. Design examples are presented to guide students with the necessary knowledge of how to design the functional electronic circuits based on certain predetermined specifications.

SEEE 3533 - Communication Principles
Pre-requisite: SEEE 2073 Signals & Systems
This course introduces the students the basic principles of communication system. The fundamental concepts of analogue modulation in particular amplitude and frequency modulations will be strongly emphasized. Topics include types of modulated waveforms, transmitter and receiver structures, and noise performance. The two most significant limitations on the performance of a communications system; bandwidth and noise will be discussed. The concept of sampling, quantization and line coding techniques in rendering an information signal to be compatible with a digital system are explained prior to the study of coded pulse modulation and pulse code modulation (PCM). The waveforms and spectral analysis of bandpass digital modulations are introduced. The system performance in terms of SNR and bit error rate (BER) will also be covered. Finally, multiplexing, a method to utilize the communication resource efficiently is studied where two main multiplexing techniques will be explored; time-division and frequency-division multiplexing.

SEEE 3732 - Common Third Year Laboratory
Third Year Laboratory is a required course for third year students in Bachelor of Engineering degree program. This course requires students to conduct twelve experiments in six different laboratories (Basic Power, Basic Machine, Basic Communication, Instrumentation, Microprocessor and Basic Control). The students are grouped into 3-4 students. Each week, they are required to conduct an experiment in the lab within 3 hours. Each group will submit only one short report at the end of each lab session. Each student is assigned to write only one long report based on one experiment that they have conducted for this course. This long report should be submitted within a week after the student performed the assigned experiment.

SEEE 3742 - Specialised 3rd Year Lab
3rd Year Laboratory is a required course for third year students in Bachelor of Engineering degree program. This course requires students to conduct four experiments in four different laboratories (Basic Power, Power Electronics, Basic Microwave and Applied Control Lab). This laboratory is conducted as a Project Based approach. The students are grouped into 3-4 students, and they will be given problems to solve that require them to conduct experiments in-lab (3 hours/week) and out-of-lab (equivalent to 2 hour/week) within three weeks. The students are required to solve the given project as a team, design suitable experimental procedures and conduct the experiments, present the problem solutions and submit a report following the IEEE standard journal format.

SEEE 4012 - Professional Engineering Practice

This course introduces and exposes the students to the concepts, theories and the practice of Professional Engineer. It highlights to the students profession of engineering, relevant acts and regulations, engineering code of ethics, engineers' roles and responsibilities, engineering ethics, the impact of the work of engineer on society, and knowledge to cater the needs for sustainable development. In terms of knowledge of accreditation of engineering programme and the internationalization of engineers, elements of EAC and Washington are also discussed. Based on this knowledge, the students will work on projects to analyze real engineering issues and cases, both individually and in groups.

SEEE 4113 - Modern Control System

Pre-requisite: SEEE 3143 Control System Design

This course introduces students the modern modeling approach of physical system namely state space. Students are introduced to state space modeling and analysis of several forms of state space representation, conversion and similarity transformation. Students are exposed to solution of state space equation, controller and observer design using pole placement method and optimal control system.

SEEE 4153 - Digital Control Systems

Pre-requisite: SEEE 3143 Control System Design

This course introduces students the basic principles underlying the analysis, synthesis and design of digital control systems. Students are introduced to sampling theorem and discretization of continuous time system, data reconstructions, z-transform, mathematical modeling of discrete-time and digital systems, time domain and various stability analysis methods for discrete-time and digital systems, and on the design of various discrete-time and digital controllers. By adapting the knowledge obtained, students will be able to derive the mathematical model of discrete-time control systems and analyze accurately its stability and the time response, as well as the students will be able to design correctly the suitable digital controller to control the discrete-time systems.

SEEE 4173 - Industrial Process Control

Pre-requisite: SEEE 3143 Control System Design

This course introduces process control system application and the wide applicability in the industry. The course initiates with modelling of process plants using fundamental laws of physics and chemistry as well as empirical process modelling. To enhance the performance of an existing process control system, controllers (PID, feedforward, cascade and inferential control) are introduced, designed, tuned and applied. Tuning techniques of Ziegler-Nichols and Cohen-coon are also utilized. Finally, the concept of supervisory, automatic control and data retrieval which relates to IoT in a process plant is introduced. In summary, this course offers students an initial exposure to the process industry and the coveted opportunity to explore more on to endless application.

SEEE 4423 - Power Systems Engineering
Pre-requisite: SEEE 4443 Power System Analysis
This course is designed to introduce the necessary concept and application of power system protection; and stability analysis of power system. Topics include, transducer, protection schemes, power system stability and circuit breaker. At the end of the course, the students are expected to complete a project on the design of a protection system based on an actual power system.

SEEE 4433 - Power Electronics and Drives
Pre-requisite: SEEE 2423 Fundamentals of Electrical Power Systems
This course introduces students to the fundamentals of power electronics, which include power semiconductor switches, rectifier (AC-DC), choppers (DC-DC), and inverters (DC-AC). Emphasis will be on the power converter operations and analysis of their steady state performances. The course also exposes students to some basic converters design and the selection of suitable converters for certain application. In addition, the course covers the operation and selection of converters for DC and AC drive systems. At the end of the course student should be able to critically design power converters at given specification using application software.

SEEE 4443 - Power System Analysis
Pre-requisite: SEEE 2423 Fundamentals of Electrical Power Systems
This course introduces students to the applications of power system analysis of a practical power system. Topics include: per-unit system, load flow analysis, symmetrical three-phase faults, symmetrical components and unsymmetrical faults. At the end of the course students are expected to apply the analysis concept in solving the real power system problems.

SEEE 4453 - Power System Control
Pre-requisite: SEEE 4423 Power System Engineering
The course introduces students to the control and operation of a power system and high voltage direct current (HVDC) system. It will discuss the basic principle of SCADA system and its application in power industry, the economic operation of power system under regulated/deregulated environment. The discussion focuses on the control strategies that can be used to generate and deliver power economically and reliably to the power system customers. The course will further discuss on the load frequency control and voltage reactive power control. The course will also introduce the basic operation of converters in HVDC system. At the end of the course, the students are expected to apply the analysis concepts in the operation of power system and HVDC system.

SEEE 4463 - High Voltage Technology
Pre-requisite: SEEE 4443 Power System Analysis
High voltage engineering is an important area in power system. The students will be exposed to the concept and theory of insulation breakdown. Key principles of high voltage technology and insulation coordination as well as insulation testing (including high voltage generators) are also covered. Lightning overvoltages due to the naturally occurring atmospheric phenomenon are a nuisance to the network and will be discussed along with switching surges. Various types of electrical discharges, some of which are used for condition monitoring applications, are also

discussed. The student is expected to be able to communicate effectively as well as to design selected high voltage components and subsystems.

SEEE 4613 - High Voltage Testing and Calibration
Pre-requisite: SEEE 4463 High Voltage Technology
In this course, the students will be exposed to the needs of testing and calibration, especially in the power system industry. Students will be introduced to concepts and theories related to high voltage and high current generation and measurement. Testing techniques related to transformers, cables and switchgears are explained, along with the calibration methods of high voltage meters and high current clamp meters. Students are also explained on matters that concern the quality of testing and calibration activity such as the traceability and uncertainty of a measurement. At the end of the course, students should be able to understand the importance, techniques involved, setting up and proper conduct of high voltage testing and calibration along with the estimation of measurement uncertainty and reporting the testing result.

SEEE 4633 - Electrical Machines
Pre-requisite: SEEE 2423 Fundamentals of Electrical Power Systems
This course is an extension of the basic power and electric machine course, exclusively offered for the electrical engineering students. The course provides the fundamentals of electric machines, which are synchronous machines, induction machines and DC machines. The course begins with electromechanical energy conversion. Next, students are introduced to principle of operations, constructions and some analysis on steady state performance of the electric machines. The course also introduces special motors and their applications, which includes single-phase induction motors, stepper motors, switch reluctance machines and universal motors. At the end of the course student should be able to perform steady state analysis of electric machines and apply their knowledge to real world applications.

SEEE 4723 - Capstone Project
The course provides students with the opportunity to integrate technical knowledge and generic skills attained in the earlier years. It requires students to conceive, engage and provide solution to a real industry/community problem. The solution is expected to be achieved within the context of an engineering project conducted in a small team (typically three or four students) under the supervision of an academic staff and with optional of industry/community partner as advisor. Topics supplementing this course that include project management tools and practices, organizational structures, engineering standards as well as the social and environmental responsibility of professional engineers are covered in the Professional Ethics and/or Engineering Management courses offered prior to or concurrent with the course.

SEEE 4812 - Final Year Project 1
The aim of the Final Year Project 1 (FYP1) is to allow the students to demonstrate a wide range of skills learned at the SKE through the design, analysis, testing, and evaluation stages in the project. The students will be exposed in identifying and formulate through literature and develop a project proposal. The final year project will include the concept of sustainable development for the project developed. Students will also learn to estimate project cost and

manage time to achieve the project objectives. This will help students to develop important skills in summarizing a research area and understanding the research problems.

SEEE 4824 - Final Year Project 2
Pre-requisite: SEEE 4812 Final Year Project 1
The aim of the Final Year Project 2 (FYP2) is to provide students the opportunity to explore and implement creative and innovative knowledge to solve practical science, mathematical and engineering societal problems. Students are exposed to project management planning and execution. With these skills, it is hoped that the students will gain knowledge and experience in planning, designing and solving problems systematically thus when they graduate, they will be ready to work as reliable and productive engineers.

SEEE 4926 - Practical Training
Students will undergo a practical training lasting for a minimum of 10 weeks at an approved private, government or semi-government agency. The school will release the list of participating agencies. Placement at the respective agency will be initiated by the applications from the students. Approval of the application is at the discretion of the school. Undergraduates are expected to acquire hands on experience not only in the engineering aspects of work, but also to other related matters such as administration, accounting, management, safety, etc. during the industrial training period.

SEEE 4643 - Control and Design Of Power Electronic Systems
Pre-requisite: SEEE 4433 Power Electronics and Drives
This course covers the knowledge on how to model power electronic converters and design their controller parameters. The course gives a brief explanation on the basic operation of power electronics converters and the necessity of having a feedback control in the system. To design a controller for the converters, averaged models based on state-space and averaged switch are introduced. Then, small-signal models are derived. For controller design, a recap on control theory i.e. open-loop system, closed-loop, phase margin, gain margin and bandwidth will be reviewed. Conventional Proportional-Integral (PI) controller design under voltage mode control (VMC) and current mode control (CMC) strategies will be performed. All the derived models will be implemented in PSPICE/MATLAB software. The course will also introduce the student on the design issues/constraints that may be faced in designing the power converters.

SEEE 4653 - Photovoltaic and Wind Energy Systems
Pre-requisite: SEEE 4433 Power Electronics and Drives
This course covers the fundamental knowledge on two popular renewable energy systems, namely photovoltaic (PV) and wind energy systems. A brief introduction will be given on the renewable sources of energy. In photovoltaic energy system, the characteristic of PV generation will be described. It follows with the integration of PV array with power electronic converters for energy harvesting. In addition to that, maximum power point tracking which acts as a controller to the PV system will be reviewed. Then, several examples of PV energy system design will be discussed. The PV systems include stand-alone and grid-connected system. At the second stage of the course, wind energy system will be introduced. The general classification of wind turbines, function of generators and speed control of wind turbine will be discussed. Then, the typically used topologies of wind energy system will be described. In this

course, students will be introduced with academic service learning, which students will pay visit to local schools to share their knowledge on PV energy systems. It will be a fun learning process where students can also contribute back to the community on what they have learned. At the end of the course, the student should be able to understand the fundamental operation and control of PV and wind energy systems.

SEEE 4663 - Electricity For Sustainable Energy
Pre-requisite: SEEE 4423 Power System Engineering
The course is designed to give an overview of energy resources such as conventional and non-conventional energy, with an emphasis on electrical energy system as well as understanding of demand growth, impact on environment and energy sustainability. Students will be introduced the various types of energy resources (RE and conventional); demand side management (DSM) options and energy efficiency (EE) measures includes managing energy used. Students will be asked to model renewable energy characteristics, for instance, photovoltaic I-V and P-V characteristics using C/C++, MATLAB and other appropriate tools. Students will also be exposed to design an energy supply system and justify the best choice based on cost benefit analysis by using HOMER software. At the end of the course students are expected to be able to apply and critically evaluate energy resources potential and demand side management options.

SEEE 4673 - Electrical Energy Market
Pre-requisite: SEEE 4443 Power System Analysis
This course introduces the students to the concept of competitive electrical energy market models. At the beginning of the course, the student will learn the difference between the old monopoly electricity market model and the new competitive electricity market model including the advantage and disadvantages of each model. Then the students will learn some of the electricity market models existed in the world in which emphasis will be given on Pool Market and Bilateral Market Model. Some of the technical issues arisen from the deregulated/competitive electricity market will also be covered in this course.

SEEE 4683 - Power System Design & Operation
Pre-requisite: SEEE 4423 Power System Analysis
This course embodies the basic principles and objectives of fundamentals of power system analysis. The aim is to instil confidence and apply the basic concepts of power system for further study and practice of electric power engineering. The course also provide an in-depth understanding of the way the entire electricity network is build, i.e. from generation, then onto transmission and finally onto the distribution network. At the end of the course, the student should be able to apply the theorems and concepts in power system design and operation. Upon completion of the course, the students would easily fit into the industry having acquired knowledge.

SEEI 4233 - Nanotechnology and Application
In this course, students will be presented with concepts, opportunities and issues related to the nanoscale world. Students will be exposed to the fundamental principles of various equipment used in observing the nanoworld. Next, knowledge related to manipulation, characterization and fabrication of micro and nano objects will be discussed. Then, students

will be exposed to the analysis of microfluidic device using finite element analysis (FEA) tool. Finally, students will be exposed to the design and development of microfluidic device using photolithography technique. In the end of the course, students are expected to acquire good understanding and able to analyse the fundamental principles of various equipment used in nanoworld. Students must be able to differentiate between various fundamental working principles used by various nano equipment. Furthermore, students should be able to use FEA and microfabrication tools to design and develop microfluidic device.

SEEI 4313 - PLC And Scada System Design
Pre-requisite: SEEE 3143 Control System Design
This course is divided into parts: (1) Automation and (2) Scada system. This is an advance subject in control engineering for final year electrical engineering students. The main aim is to develop concepts in industrial control engineering to the students. Fundamental concepts in manufacturing and automation, building blocks of automation. Simple modeling and analysis process transducers and controllers, drivers and final control elements. Industrial logic control system, sequence control using electronic logic components and programmable logic controllers (PLC) in simple process, control system and automated control system. SCADA is the process of a plant and / or a method of gathering of data from devices in the field. This the process of collecting data into the actual business, and using it in real time. There are using standard communication protocols (eg IEC 60870, DNP3 and TCP/IP) and hardware and software. Many SCADA applications use PLCs as the RTU of choice,when communicating with field devices. This subject covers the essentials of SCADA and PLC systems, which are often used in close association with each other. A selection of case studies are used to illustrate the key concepts with examples of real world working SCADA and PLC systems in the water, electrical and processing industries.

SEEI 4363 - Industrial Control Networks
Pre-requisite: SEEE 3143 Control System Design
The aim of this course is to present basic concepts in industrial control networks to students. It will highlight the basic system of interconnected equipment used to monitor and control the physical equipment in industrial environment. Fundamental concepts in conventional and industrial networks are initially described. Industrial control network components such as PLC, DCS and SCADA are also studied. The hierarchical and architecture of every level in industrial control networks are also discussed. The types of network protocols which are often used in industrial environment at every level are described.

SEEL 3613 - Semiconductor Material Engineering
Pre-requisite: SEEE 1073 Electronic Devices and Circuits
The purpose of this course is to provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices. In order to gain this understanding, it is essential to have a thorough knowledge of the basic physics and operation of the semiconductor material. The goal of this course is to bring together crystal structures, quantum mechanics, quantum theory for solids, semiconductor material physics, and fundamental of PN structures. All of these basic components are vital for students to understand the operation of present day and future electronic devices.

SEEL 4223 - Digital Signal Processing 1
Pre-requisite: SEEE 2073 Signal and System
This course introduces concepts in digital signal processing. Continuous-time signals and systems will be reviewed. Consecutively, introduction to digital signal processing, basic idea, benefits and applications are presented. Discrete-time signals and systems are described based on signal definition, periodicity, stability, causality, convolution, difference equations, infinite impulse response (IIR), finite impulse response (FIR) and signal flow graphs. Spectrum representation of discrete-time signals will cover sampling theorem, the discrete-time Fourier transform (DTFT) and its properties, and Discrete Fourier Transform (DFT). Another domain presented is Z-transform which consists of topics on derivations, region of convergence, transformation properties, poles and zeros, and inverse z-transform. At the end of the course, analysis and design of digital filters covers filter basics, analog filter prototypes and design of IIR filter and FIR filter.

SEEL 4273 - CAD with HDL
Pre-requisite: SEEE 2263 Digital Systems
This course introduces students to the use of computer-aided-design (CAD) tools and hardware description language (HDL) for the design of complex digital systems. Students will use CAD tools to model, design, analyze, synthesize, implement, and verify systems that are specified using the Register Transfer Level (RTL) methodology. Systems verification methods using scripts and testbenches will be introduced. Memory controller design and interfacing will be covered, including the use of RAMs, ROMs, Fifos, and external memory.

SEEL 4283 - Analog CMOS IC Design
Pre-requisite: SEEE 1073 Electronic Devices and Circuits
In this course students will be taught the characteristics of MOSFET transistor as a prerequisite of CMOS analog design. It highlights the nonlinearity as an imperfection, which will limit the performance of analog circuits. The course will then proceed to analyse CMOS single ended as well as differential amplifiers. The trademark of analog design, which is the design challenge to fulfil design matrix, will be highlighted. Students will be guided on design principles to meet design specifications with acceptable accuracy. Op Amp design will be addressed towards the end of the course.

SEEL 4373 - IC Testing Techniques
Pre-requisite: SEEE 2263 Digital Systems; SEEL 4283 Analog CMOS IC Design
This course introduces students to the techniques of testing a digital circuit and designing a testable digital circuit. Several fault models including single stuck-at fault model will be analyzed in details. Fault simulation methods are covered as well in this course. Test pattern generation and design-for-testability are also introduced to students. In order to facilitate learning process, computer-aided design (CAD) software is used throughout the course. Some practical or almost actual environment problems and solutions are provided.

SEEL 4743 - Basic Digital VLSI Design
Pre-requisite: SEEE 2263 Digital Systems
The objective of this course is to introduce students to basic techniques to design and implement digital VLSI system. This course introduces students to VLSI technology. A historical perspective on the evolution of integrated circuit technology is covered. Important issues when designing a VLSI circuit are discussed. MOS transistors are studied in detail, including their characteristics, structure, switch-level behaviour, and current equation. SPICE model of a MOS transistor is also described. The simplest circuit, an inverter, is studied in detail. Its voltage-transfer characteristic, noise margin and how to control the inversion point is investigated. How an IC is fabricated is described. Fabrication processes are elaborated. Layout, design rules and stick diagram are explained. This course teaches how to design circuits. Several logic families will be introduced. Advantages and disadvantages of each logic design style are explained. Delay and power performance of each logic family is also compared. Latch and flip-flop circuits are also covered. Interconnect issues, when various components are connected, are elaborated.

SEEM 4173 - Artificial Intelligence
Artificial intelligence (AI) involves the development of algorithms derived from human and animal intelligence that have capabilities such as learning, reasoning, generalization, adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many domestic and industrial products and provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) and Particle Swarm Optimization (PSO), and how they are used as a stand-alone approach or in any combination of the methods in solving engineering and non-engineering problems.

SEET 3573 - Microwave Engineering
Pre-requisite: SEEE 3533 Communication Principles
To introduce the basic theory of Microwave Engineering, such as transmission line theory, scattering parameters, Smith Chart, and impedance matching. Fundamental microwave devices, such as waveguides and resonators are explained. The students are also introduced to passive and active microwave components such as terminations, couplers, power dividers/combiners, circulators, amplifiers, oscillators, travelling wave tubes, filters, and microwave solid-state devices. Fundamentals in microwave instruments and measurement techniques are introduced.

SEET 3583 - Digital Communication System
Pre-requisite: SEEE 3533 Communication Principles
This course provides an introduction to fundamental concepts in digital communication system. Main topics to be covered are baseband pulse transmission, signal space analysis, digital modulation/demodulation, channel coding, source coding, detection methods and evaluation in AWGN channel. Fundamentals on error control coding is also included. Finally, the system trade-off in designing a digital communication system is explored.

SEET 3623 - Data Communication and Network
Pre-requisite: SEEE 3533 Communication Principles
The objective of the subject is to enhance the students' knowledge on data communication and computer networks. It explains the basic process of data communication, protocol, interfacing and inter-working between computer networks and switching components in telecommunication system. At the end of the course, the students should be able to understand the system used in representation, distribution, transmission and reception of data in data communication network.

SEET 4533 - Wireless Communication Systems
Pre-requisite: SEET 3573 Microwave Engineering
This course introduces students the concept and principle of mobile radio communication and satellite communication system. Topics covered include mobile radio propagation, multiple access, cellular concept, modern wireless communication systems and satellite communication systems.

SEET 4543 - RF Microwave Circuit Design
Pre-requisite: SEET 3573 Microwave Engineering
This course introduces students to the concept of designing RF/Microwave circuit in wireless communication system such as filters, amplifiers, oscillators and mixers. The design of the RF/Microwave circuit is based on the discrete components and the S-parameter of the component. The system block diagram is also discussed such as transmitter and receiver function and noise in communication system. The filter design is based on the lump component and the resposnse of the filter such as Butterworth and Chebyshev response. The matching concept is discussed further in the RF/Microwave amplifier and oscillator design using Smith chart. The analysis of the different mixer is also discussed in this subject.Simulation software CST will also introduced to facilitate learning process.

SEET 4593 - Acoustic Engineering
Pre-requisite: SEET 3533 Communication Principles
This course embodies the basic principles of fundamentals of acoustics engineering. The aim is mainly to instil confidence and apply the basic concepts, theories and applications in acoustics, noise control, room acoustics and sound system design. The course provides an in depth understanding of the characteristics, propagations, transmission and attenuation of sound waves. Further, noise criteria and control of interfering noise, sound absorption and reflection shall follow. The last part of the course cover on good room acoustics and sound system design for an enclosed room. At the end of the course, the students shall be able to apply the acoustics engineering fundamentals and concept in designing enclosed room for optimum acoustics and sound system.

SEET 4613 - Antenna Theory and Design
Pre-requisite: SEET 3573 Microwave Engineering
This course introduces students the concept of antenna, theory and design in telecommunication system. The basic antenna properties such as gain, polarization, directivity, efficiency, and radiation pattern for various types of antenna will be discussed.

Several antennas with specific characteristic will be designed using simulation software and analysed. Finally, the antenna measurement setup is introduced and discussed.

SEET 4623 - Network Programming
Pre-requisite: SEET 3623 Data Communication and Networks
The objective of this course is to introduce students to the basic of network programming, in the networking implementations. This course will provide the students with understanding of socket programming to interconnect computers in network. The module will cover topics such as treads, input-output streams, handling errors and exceptions in socket programming. By the end of the module, students should have an understanding of interfacing between client and server.

SEEE 5533 - Power Electronics Systems
This course provides an understanding of the principles of power electronic conversion systems and the ability to design power converters for certain applications. The topics covered are: 1. Concepts and prospects of power electronic systems: modern power switches, switching methods, drivers and losses in power electronics system. 2. ac-to dc conversion: rectifier with different loads, performance criteria, line distortion, effects of line inductance/overlap. 3. dc to dc conversion: non-isolated topologies-Buck, Boost, Buck-boost in DCM operation, non-idealities, isolated topologies-Flyback, Full-Bridge, switched-mode power supply, converter control. 4. dc to ac conversion: single-phase, three-phase, PWM and SVM techniques, harmonics elimination and multilevel inverter topologies. The focus is the design of power converters for specific applications such as utility, domestic appliance, electric vehicle and industrial applications.

SEEE 5583 - High Voltage and Electrical Insulation
This course provides an understanding of high voltage phenomena, and to present the concepts of high voltage insulation in power systems networks. The first part of the course describes the concept of electric stress and the phenomena of conduction and breakdown in insulation materials in order to provide the students with a firm knowledge on high voltage phenomena and insulation technology. The second part of the course covers the introduction to dielectric properties of materials, diagnostic testing of insulation, overvoltages and insulation coordination. By adapting this knowledge, students will be able to develop essential technical skills in solving real-world problems involving insulation characteristics with some degree of acceptable conditions. The students will conduct experimental works and/or simulation works to solve engineering problems related to high voltage engineering applications.

SEEE 5603 - Power System Analysis and Computational Method
Basic Power Network Concepts, Power Transmission Lines Transformer and generator and their respective parameters and equivalent circuit models will be reviewed in this course. Students will formulate rigorously power system network model and Bus admittance matrix with appreciate all assumptions made. The application of Bus admittance matrix to Fault Analysis and the application of symmetrical sequence components to unbalanced fault analysis will be covered. Further application of the power system network model and numerical techniques will be used to solve Power Flow analysis using 2 different methods; Newton-Raphson Method and the Decoupled Load Flow. The student is expected to write and develop basic fault analysis and load flow analysis program. The programs will be tested with IEEE

test systems with the aim to achieve results comparable with commercial software. Commercial grade professional software will be used to design simple and practical reactive power and voltage control. The concept of Multi-machine transient stability analysis will be covered in the course, in order to understand large scale power system response to any power disturbance.

SEEE 5633 - Power System Devices and Apparatus

This course features relevant apparatuses and devices in the operation of power system. It involves discussions on features and characteristics of power system devices such as synchronous machines, transmission lines, transformers and induction machines. Then, the dynamic aspects of the devices will be covered. Students are then expected to be able to propose a design and perform relevant analysis using computer software on power system configurations consisting of these devices and apparatuses. By integrating the knowledge, the students will be able to develop technical skills related to design and operation of power system.

SEEL 5123 - Advanced Microprocessor System

This course is about microprocessors in embedded systems. This course extends the students' knowledge of microprocessors by investigating embedded systems design and state-of-the-art 32-bit embedded processors. The student will be familiarized with problems associated with producing hardware and software in high-level language and assembly language for embedded systems. The topics covered include high-level (C/C++ programming) and assembly language programming for embedded microprocessors, memory and peripherals for embedded systems, system development, embedded real-time operating systems and optimizing performance of embedded systems.

SEET 5313 - Communications and Computer Networks

This course will enhance the students' knowledge on communication and computer network. It explains the advance concept of network layers, protocols, interfacing and inter-working between computer networks and network devices in telecommunication systems. The students will be taught with the various possible techniques to understand the modern networks for wired and wireless services.

SEET 5413 - Advanced Digital Communication

This course provides fundamental concepts in the analysis and design of digital communication system. Main topics to be covered are introduction to information theory, signal space analysis, digital modulation/demodulation over AWGN channel, baseband transmission over bandlimited channel, channel coding, error control coding. Finally, the system trade-off in designing a digital communication system in AWGN channel is explored.

SEEL 5113 - Advanced Nanoelectronics Devices

Semiconductors form the basis of most modern electronics systems. This course is designed to provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices. In order to gain this understanding, it is essential to have a thorough knowledge of the physics of the semiconductor material. The goal is to bring together quantum mechanics, the quantum theory of solids, semiconductor material physics, and semiconductor

device physics. All of these components are vital to the understanding of both the operation of present day devices and any future development in the field. This course is a continuation to Microelectronics at undergraduate level and introduces advance device concepts.

SEEL 5193 - Advanced Analog CMOS IC Design

This course introduces students to the advanced level of CMOS design in analog circuits. In the beginning, it highlights the operational concept of MOSFET transistors and their nonlinearity characteristics that will limit the performance of analog circuits. The course will then proceed to analyze CMOS single ended as well as differential amplifiers. The advantages and disadvantages between different architectures will be discussed. The trademark of analog design which is the design challenge to fulfill design matrix will be emphasized. Students will be guided on design principles to meet design specifications with acceptable accuracy. Important sub-modules differential amplifier and op amps will be studied in detail towards the end of the course.

SEEM 5753 - Advanced Instrumentation and Measurement

This course is an introduction to the advanced instrumentation and measurement. Key components studied in details are a review of powerful measurement techniques and basic principles and typical problems of sensor elements, detailed up-to-date reviews of the features of temperature sensors, displacement sensors, flow sensors, level sensors, position sensors, motion sensors and biometrics. This course also provides a detailed knowledge on error and determination of uncertainties in measurement. Besides that, this course introduces the multi sensor, Fusion application, wireless sensor network and Internet of Things. Finally, the basic concepts of safety instrumented system, standards and risk analysis techniques will be discussed.

SEEM 5713 - Artificial Intelligence and Applications

Artificial intelligence (AI) involves the development of algorithms derived from human & animal intelligence that have capabilities such as learning, reasoning, generalization, adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many domestic & industrial products & provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) & Particle Swarm Optimization (PSO), & how they are used in solving engineering & non-engineering problems.

SEEM 5703 - Control Systems Engineering

This course introduces the students to the fundamental concepts of control systems engineering. Students will be exposed with techniques of modelling of physical systems involving linear and nonlinear systems including mechanical, electrical and mechatronic systems. Both the frequency domain and time domain (state-space) are covered. Several criteria for performance and stability analyses of control systems will be taught. Modelling and analysis of control system in discrete time for digital control will also be introduced. Student will also be exposed with MATLAB for design, development and analysis of simulation models. Finally, a feedback control system with controller to achieve control system objectives are described. Several case studies of the applications of controllers will be used to enhance the student understanding.

SEET 5313 - Communications and Computer Networks

This course will enhance the students' knowledge on communication and computer network. It explains the advance concept of network layers, protocols, interfacing and inter-working between computer networks and network devices in telecommunication systems. The students will be taught with the various possible techniques to understand the modern networks for wired and wireless services.

SEET 5513 - Sustainable Design, Engineering and Management

The aim is to give students an insight and understanding of the environmental and sustainability challenges that are facing by Communication Engineers and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy, Life Cycle Assessment (LCA) and green technology. Students will also experience conducting case studies and project-based learning encompassing four themes in sustainability which are connecting, conceptualizing, valuing and implementing.

SEET 5423 - Wireless Communication Systems

This course introduces students to introductory and advanced level of wireless communication technologies. In the beginning students will be presented with the concept of wireless communication systems and mobile radio propagation. Students will then be illuminated on MIMO technology in mobile communication. Next, the course will describe on cellular concepts that will include small cell networks. This is followed by details on the overall evolution of mobile communication system. Finally, this course will cover on different multiple access techniques used in wireless communication systems.

SEET 5523 - Internet of Things Technology

The course provides students with a technical background to the Internet of Things (IoT) which includes its concept, architecture and applications. It also gives the underlying communication protocols and technologies. The course has a significant practical element that will be delivered during lab sessions in which students are expected to complete exercises involving system design, device programming and cloud development.

BACHELOR OF ELECTRONIC ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Electronic Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Electronic Engineering with Honours	
4. Final Award			Bachelor of Electronic Engineering with Honours	
5. Programme Code			SEELH	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study (Conventional, distance learning, etc)			Conventional	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum : 4 yrs Maximum : 6 yrs	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Tme	Part Time
Normal	8	-	18	-
Short	4	-	10	-

Course Classification

Bachelor of Electronic Engineering with Honours - SEELH

No.	Classification	Credit Hours	Percentage
i.	University Courses a) General b) Language c) Entrepreneurship d) Co-Curriculum	 23 8 2 3	26.3%
ii.	School/Programme Core	77	56.2%
iii.	Programme Electives	24	17.5%
	Total	**137**	**100%**
A	Engineering Courses a) Lecture/Project/Laboratory b) Workshop/Field/Design Studio c) Industrial Training d) Final Year Project	 89 0 6 6	73.7%
Total Credit Hours for Part A		**101**	
B	Related Courses a) Applied Science/Mathematic/Computer b) Management/Law/Humanities/Ethics/Economy c) Language d) Co-Curriculum	 15 10 8 3	26.3%
Total Credit Hours for Part B		**36**	
Total Credit Hours for Part A and B		**137**	100%
Total Credit Hours to Graduate		**137 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 137 credit hours (SKEL) with a minimum CGPA of 2.0.
- Complete Professional Skills Certificates (PSC).

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Become Electronic Engineers who are competent, innovative, and productive in addressing customer needs.
PEO2	Grow professionally with proficient soft skills.
PEO3	Demonstrate high standards of ethical conduct, positive attitude, and societal responsibilities.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Ability to apply knowledge of mathematics, science and electrical/electronic engineering to the solution of complex engineering problems.
PLO2	Ability to perform research-based analysis, conduct experiments and interpret data for complex engineering problems.
PLO3	Ability to identify, formulate, conduct research literature to analyse complex engineering problems using engineering knowledge.
PLO4	Ability to apply engineering practice and use modern engineering, and IT tools for complex engineering problem with an understanding the limitations of the technology.
PLO5	Ability to design solutions for complex engineering problems and design systems and processes that meet specified needs with appropriate consideration for public health and safety, culture, society, and environment.
PLO6	Ability to articulate ideas, communicate effectively, in writing and verbally, on complex engineering activities with the engineering community and with society at large.
PLO7	Ability to function effectively as an individual, as a member or as a leader in diverse teams.
PLO8	Ability to recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PLO9	Ability to comprehend the impact of global and contemporary issues, the role of engineers on society including, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practices and engineering problems.
PLO10	Ability to comprehend and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts.
PLO11	Ability to grasp and execute responsibility professionally and ethically in professional engineering practices.
PLO12	Ability to demonstrate knowledge and understanding of engineering and management principles, and economic decision-making to manage projects in multidisciplinary environments.

PROFESSIONAL SKILLS CERTIFICATE (PSC)

New PSC courses are introduced to new and current students starting from Session 2020/2021. Students are required to undertake and pass Five (5) Professional Skills Certificate (PSC) courses of UTM Institute for Life Ready Graduate (UTM ILeague). These courses are offered and managed by School of Professional and Continuing Education (SPACE) in collaboration with Schools or Faculties. Students are required to register the courses through SPACE Website.

List of PSC courses are as follows:

No.	PSC COURSE	OFFERED AND MANAGED BY SPACE IN COLLABORATION WITH
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	UTM Excite
2	Talent and Competency Management	UTM Career Centre (UTMCC)
3	English Communication Skills for Graduating Students (ECS)	Language Academy
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	Faculty of Engineering (FE)
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	Schools or Faculties at UTM

COURSE MENU

Bachelor of Electronic Engineering with Honours - SEELH

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 1012	Introduction to Electrical Engineering	2	
SEEE 1013	Electrical Circuit Analysis	3	
SEEE 1022	Introduction to Scientific Programming	2	
SSCE 1693	Engineering Mathematics I	3	
UHMT 1012	Graduate Success Attributes	2	
UHLB 1112	English Communication Skills	2	
UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**16**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECP 1103	C Programming Techniques	3	
SEEE 1073	Electronic Devices and Circuits	3	SEEE 1013
SEEE 1223	Digital Electronics	3	
SSCE 1793	Differential Equations	3	
SEMU 2113	Engineering Science	3	
UHIS 1022	Philosophy and Current Issues (Local Students)	2	
UHLM 1012	Malay Language for Communication 2 (International Students)		
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**33**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 2073	Signal and Systems	3	
SEEE 2133	Electronic Instrumentation and Measurement	3	
SEEE 2423	Fundamentals of Electrical Power Systems	3	SEEE 1013
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UHLB 2122	Academic Communication Skills	2	

UKQF 2**2	Elective of Co-Curricular Service Learning	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**49**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 2263	Digital Systems	3	SEEE 1223
SEEE 2523	Electromagnetic Field Theory	3	SSCE 1993
SEEE 2742	2nd Year Electronic Design Laboratory	2	
SEEE 3263	Electronic Systems	3	SEEE 1073
SSCE 2193	Engineering Statistics	3	
UBSS 1032	Introduction to Entrepreneurship	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**65**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3133	System Modelling and Analysis	3	SEEE 2073
SEEE 3223	Microprocessor	3	SEEE 1223
SEEE 3533	Communication Principles	3	SEEE 2073
SEEE 3732	Common 3rd Year Laboratory	2	
SSCE 2393	Numerical Methods	3	
UHL* 1112	Elective of Foreign Language	2	
UKQT 3001	Extra Curricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**82**	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3143	Control System Design	3	SEEE 3133
SEEL 3742	Specialized 3rd Year Laboratory	2	
SEEL 4223	Digital Signal Processing I	3	SEEE 2073
SEE* ***3	Field Core 1	3	
SEE* ***3	Field Core 2	3	
UHLB 3132	Professional Communication Skills	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**98**	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SEEL 4926	Practical Training	6	
	TOTAL CREDIT	**6**	
	CUMULATIVE CREDITS	**104**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SHMS 4542	Engineering Management	2	
SEEL 4723	Capstone Project	3	
SEEL 4812	Final Year Project Part I	2	
SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	
SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	
SEE* ***3	Field Elective 3	3	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**120**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4012	Professional Engineering Practice	2	
SEEL 4824	Final Year Project Part II	4	SEEL 4812
SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	
SEE* 4**3 / SEE*5**3	Field Elective 4 / PRISMS Elective 4	3	
SEE* ***3	Field Elective 6	3	
UHIT 2302	Science and Technology Thinking	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**137**	

Elective Courses

1. Electronic System Design

Field Core	Course	Credit	Pre-requisite
SEEL 4273	CAD with HDL	2	SEEE 2263
SEEL 4743	Basic Digital VLSI Design	3	SEEE 2263

Field Elective	Course	Credit	Pre-requisite
SEEL 4283	Analog CMOS IC Design	3	SEEE 1073
SEEL 4293	Advanced Digital Signal Processing	3	SEEL 4223
SEEL 4333	Computer Architecture and Organization	3	SEEE 2263
SEEL 4363	Digital Image Processing	3	SEEL 4223
SEEL 4373	IC Testing Techniques	3	SEEE 2263 SEEL 4283
SEEL 4663	Embedded Processor System	3	SEEE 3223 SECP 1103
SEEL 4673	DSP Architectures	3	

2. Microelectronics

Field Core	Course	Credit	Pre-requisite
SEEL 3613	Semiconductor Material Engineering	3	SEEE 1073
SEEL 4743	Basic Digital VLSI Design	3	SEEE 2263

Field Elective	Course	Credit	Pre-requisite
SEEI 4233	Nanotechnology and Application	3	
SEEL 4283	Analog CMOS IC Design	3	SEEE 1073
SEEL 4373	IC Testing Techniques	3	SEEE 2263 SEEL 4283
SEEL 4613	Semiconductor Device Engineering	3	SEEL 3613
SEEL 4623	Solid-State Electronic Devices	3	SEEL 3613
SEEL 4633	Microelectronic Device Fabrication and Characterization	3	SEEL 3613
SEEL 4643	Nanoelectronics	3	

SEEL 4653	Modelling and Simulation of Microelectronic Devices	3	

3. Computer Engineering

Field Core	Course	Credit	Pre-requisite
SEEL 4333	Computer Architecture and Organization	3	SEEE 2263
SEEL 4663	Embedded Processor System	3	SEEE 3223 SECP 1103

Field Elective	Course	Credit	Pre-requisite
SECR 2043	Operating System	3	SECP 1103
SEEL 4213	Software Engineering	3	SECP 1103
SEEL 4273	CAD with HDL	3	SEEE 2263
SEEL 4343	Information Security	3	SEEE 1223
SEEL 4673	DSP Architectures	3	SEEE 2263
SEEM 4173	Artificial Intelligence	3	
SEET 3623	Data Communication and Networks	3	SEEE 3533

4. Medical Electronics

Field Core	Course	Credit	Pre-requisite
SEEL 3503	Physiology and Introduction to Medicine	3	
SEEL 4523	Medical Instrumentation	3	SEEE 2133

Field Elective	Course	Credit	Pre-requisite
SEBB 3313	Biomedical Material	3	
SEEL 4273	CAD with HDL	3	SEEE 2263
SEEL 4513	Clinical Engineering	3	SEEL 3503
SEEL 4533	Biomedical Signal Processing	3	SEEL 4223
SEEL 4543	Biosystem Modelling	3	SEEL 3503
SEEL 4553	Medical Imaging	3	SEEL 4223
SEEL 4563	Biosensors and Transducers	3	SEEE 2133
SEEL 4573	Rehabilitation Engineering	3	

5. Telecommunication Engineering

Field Core	Course	Credit	Pre-requisite
SEET 3573	Microwave Engineering	3	SEEE 3533
SEET 3623	Data Communication and Networks	3	SEEE 3533

Field Elective	Course	Credit	Pre-requisite
SEET 3583	Digital Communication System	3	SEEE 3533
SEET 4523	Optical Communication Systems	3	SEEE 3533
SEET 4533	Wireless Communication Systems	3	SEET 3573
SEET 4543	RF Microwave Circuit Design	3	SEET 3573
SEET 4593	Acoustic Engineering	3	SEEE 3533
SEET 4613	Antenna Theory and Design	3	SEET 3573
SEET 4623	Network Programming	3	SEET 3623
SEET 4633	Coding of Multimedia Signals	3	SEET 3583
SEET 4643	Optical Materials and Sensors	3	SEET 4523
SEET 4653	Measurement and Characterization of Optical Devices	3	SEET 4523
SEET 4663	Optical Network	3	SEET 4523

SEELH Elective Courses for PRISM (CHOOSE MAXIMUM 4)			
Code	**Course**	**Credit**	**Pre-requisite**
SEEL 5123	Advanced Microprocessor System	3	
SEEL 5173	Advanced Digital System Design	3	
SEET 5313	Communications and Computer Networks	3	
SEET 5413	Advanced Digital Communication	3	
SEEL 5113	Advanced Nanoelectronics Devices	3	
SEEL 5193	Advanced Analog CMOS IC Design	3	
SEEM 5753	Advanced Instrumentation and Measurement	3	
SEEM 5713	Artificial Intelligence and Applications	3	
SEEM 5703	Control Systems Engineering	3	

SEELH Elective Courses for PRISM (CHOOSE MAXIMUM 4)			
Code	**Course**	**Credit**	**Pre-requisite**
SEET 5313	Communications and Computer Networks	3	
SEET 5513	Sustainable Design, Engineering and Management	3	
SEET 5423	Wireless Communication Systems	3	
SEET 5523	Internet of Things Technology	3	

PRISMS ELECTIVE COURSES

For students who intend to enroll into PRISMS programme, refer to the PRISMS Section for a list of related elective courses associated with the postgraduate programmes.

Requirements

Students who are eligible to apply for PRISMS are those with academic qualification who are in Year 3 Semester 2 with cumulative average grade value of CGPA 3.3 and above. Students can apply for PRISMS in Year 3 Semester 2 through the Program Integrasi Sarjana Muda-Sarjana (PRISMS) application form and must be recommended by the Academic Advisor, approved by the Program Director and certified by the Chair of School or Dean of Faculty.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

Bachelor of Electronic Engineering with Honours - SEELH

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
BACHELOR OF ENGINEERING (ELECTRICAL - ELECTRONICS)					
1.	SEEE 1012	Introduction to Electrical Engineering	2	2	
2.	SEEE 1013	Electrical Circuit Analysis	3	3	
3.	SEEE 1022	Introduction to Scientific Programming	2	2	
4.	SEEE 1073	Electronic Devices and Circuits	3	3	
5.	SEEE 1223	Digital Electronics	3	3	
6.	SEEE 2073	Signal and Systems	3	3	
7.	SEEE 2133	Electronic Instrumentation & Measurement	3	3	
8.	SEEE 2263	Digital Systems	3	3	
9.	SEEE 2423	Fundamentals of Electrical Power Systems	3	3	
10.	SEEE 2523	Electromagnetic Field Theory	3	3	
11.	SEEE 2742	2nd year Electronic Design Lab	2	2	
12.	SEEE 3133	System Modelling & Analysis	3	3	
13.	SEEE 3143	Control System Design	3	3	
14.	SEEE 3223	Microprocessor	3	3	
15.	SEEE 3263	Electronic System	3	3	
16.	SEEE 3533	Communication Principles	3	3	
17.	SEEE 3732	Common 3rd year Laboratory	2	2	
18.	SEEE 4012	Professional Engineering Practice	2	2	
19.	SEEL 3742	Specialized 3rd year Laboratory	2	2	
20.	SEEL 4223	Digital Signal Processing I	3	3	
21.	SEEL 4723	Capstone Project	3	3	
22.	SEEL 4812	Final Year Project Part I	2	2	
23.	SEEL 4824	Final Year Project Part II	4	4	

24.	SEEL 4926	Practical Training	6	HL	
25.	SEMU 2113	Engineering Science	3	3	
26.	SEE* ***3	Field Core 1	3	3	
27.	SEE* ***3	Field Core 2	3	3	
28.	SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	3	
29.	SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	3	
30.	SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	3	
31.	SEE* 4**3 / SEE*5**3	Field Elective 4 / PRISMS Elective 4	3	3	
32.	SEE* 4**3	Field Elective 5	3	3	
33.	SEE* ***3	Field Elective 6	3	3	
34.	SECP 1103	C Programming Techniques	3	3	
35.	SHMS 4542	Engineering Management	2	2	
		TOTAL CREDIT OF ENGINEERING COURSES (a)	**101**	**95**	
MATHEMATICS COURSES (Faculty of Science)					
1.	SSCE 1693	Engineering Mathematics I	3	3	
2.	SSCE 1793	Differential Equations	3	3	
3.	SSCE 1993	Engineering Mathematics II	3	3	
4.	SSCE 2193	Engineering Statistics	3	3	
5.	SSCE 2393	Numerical Methods	3	3	
		TOTAL CREDIT OF MATHEMATICS COURSES (b)	**15**	**15**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1.	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			
2.	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			

Cluster 2: Generic Skills					
1.	UHMT 1012	Graduate Success Attributes	2	2	
2.	UBSS 1032	Introduction to Entrepreneurship	2	2	
Cluster 3: Knowledge Enhancement					
1.	UHIT 2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1.	UKQF 2**2	Elective of Co-Curricular Service Learning	2	2	
2.	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1.	UHLB 1112	English Communication Skills	2	2	
2.	UHLB 2122	Academic Communication Skills	2	2	
3.	UHLB 3132	Professional Communication Skills	2	2	
4.	UHL* 1112	Elective Of Foreign Language	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**21**	**21**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**137**	**131**	
OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC). • **Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.** • **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**					
COMPULSORY PSC COURSES (Enroll all 4 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	Faculty Engineering Safety Pass (FESP) *MODULE 1 - compulsory for SKM, SKT and SKE students* *MODULE 2 – compulsory for SKA, SC, SKBSK students*			
4	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
ELECTIVE PSC COURSE (Choose 1 only)					
1	GSPX XXXX	Data Analytics for Organization			

2	GSPX XXXX	Writing	
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical Works)	
4	GSPX XXXX	Professional Ethics and Integrity	
5	GSPX XXXX	More elective courses to be added in future	

COURSE SYNOPSIS

SEEE 1012 - Introduction to Electrical Engineering

This course serves as a general introduction to electrical engineering programmes offered by the School of Electrical Engineering (SEE), Universiti Teknologi Malaysia (UTM). Students undertaking this course will be exposed to attributes of electrical engineers from both academic and practical points of view. Soft skills and knowledge that are necessary in the engineering world will be introduced to the students. The students will have a clearer understanding on the responsibilities of electrical engineers to the society. By exploring contemporary issues, the students would be able to suggest sustainable solutions to the mankind and its environment.

SEEE 1013 - Electrical Circuit Analysis

This course introduces students to the basic laws, methods of analysis and theorems for direct current, DC and alternating current, AC circuit, such as, Ohms Law, Kirchhoff's Current and Voltage Laws, Mesh and Nodal Analysis and Thevenin's and Norton's Theorems. Based on these, the students are expected to be able to solve for variables in any given DC and AC electric circuits. The students also exposed to the steady-state electrical circuit. Afterwards, the relevant concepts in transient circuit analysis for first and second order circuit are taught to the students. With the knowledge learned, the student would be able to apply the basic laws, theorem and methods of analysis for solving completely with confidence various problems in circuit analysis.

SEEE 1022 - Introduction to Scientific Programming

This course introduces the fundamentals of scientific programming languages and techniques used by engineers to solve engineering problems. Students will be introduced to common scientific programming languages and their comparative advantages and disadvantages. Emphasis is placed on fundamentals of programming, program design, verification and visualization. The goal is to provide the students with the skills in scientific computing, tools, techniques that can be used to solve their own engineering problems. Students will learn to implement algorithms using high level programming language (e.g. MATLAB, Mathematica, FORTRAN). The programming skills acquired in this course will allow students to go beyond what is available in pre-packaged analysis tools, and code their own custom data processing, analysis and visualization for any engineering problem.

SEEE 1073 - Electronic Devices & Circuits

Pre-requisite: SEEE 1013 Electrical Circuit Analysis

This course provides introduction to the basic operating principles and applications of discrete electronic devices and circuits. The course content starts with the fundamental solid-state principles and continues the discussions with the constructions and characteristics of diode, Bipolar Junction Transistor (BJT) and Enhancement Metal Oxide

Semiconductor Field Effect Transistor (E-MOSFET). The application of diodes focuses on the basic power supply circuits whereas the applications of the transistors focus on the small-signal amplifier. The course content ends with an introduction to the operating principles of an ideal operational amplifier (op-amp) and discussion about op-amp circuits, performance and

applications. To help the students understand the behaviour of the electronic devices and predict the behaviour of the electronic circuits, this course makes use of Multisim simulation software. The goal of this course is to develop excellent understanding of the devices operation for students to be applied in analogue and digital circuit design.

SEEE 1223 - Digital Electronics

This course teaches the fundamental principles of digital systems. From the signal concepts and the importance of numbers systems and codes, it then proceeds to logic gates, their relationship to Boolean algebra and the integration of gates to form complex circuits. The course emphasizes on techniques to design, analyse, plan, and implement simple digital systems using gates and MSI circuits. Simulation software Quartus II version 13 will also be introduced to facilitate learning process.

SEEE 2073 - Signals and Systems

This course introduces the students the fundamental ideas of signals and system analysis. The signal representations in both time and frequency domains and their effects on systems will be explored. Specifically, the topics covered in the course include basic properties of continuous-time and discrete-time signals, the processing of signals by linear time-invariant (LTI) systems, Fourier series, Fourier and Laplace transforms. Important concepts such as impulse response, frequency response and system transfer functions as well as techniques of filtering and filter design, modulation, and sampling, are discussed and illustrated. This course will serve as a central building block for students in studying information processing in many engineering fields such as control systems, digital signal processing, communications, circuit design, etc.

SEEE 2133 - Electronic Instrumentation and Measurement

This course introduces students some of the metrological terminologies used in experimental methods, concept of metrology and its application. The course will also provide understanding the concept electrical measurement quantity using analogue and digital instruments. The interfaces of the instruments with embedded sensors and also the quality of the signals acquired are introduced. Besides that, this course also introduces the type of electrical noise and the ways to reduce noise and interference. Finally, the fundamental principle of transducers, transducer operations, characteristic and functions will be discussed. P&ID diagram also introduces to cover the basic process of the system.

SEEE 2263 - Digital Systems

Pre-requisite: SEEE 1223 Digital Electronics

This course is a continuation from basic digital logic techniques course. The objective of the course is to introduce students to basic techniques to design and implement complex digital systems It emphasizes on techniques to design, analyse, plan, and implement complex digital systems using programmable logic. To facilitate learning process, computer-aided design (CAD) software is used throughout the course. Actual environment problems and solutions are provided.

SEEE 2423 - Fundamentals of Electrical Power Systems
Pre-requisite: SEEE 1013 Electrical Circuit Analysis
This course introduces fundamental concepts of electric machines and power system. Students should be able to identify components of the system from the course and describe their basic operations from the course having electromagnetic and circuit concepts learned in previous fundamental courses. These fundamental concepts are further elaborated in applications of electric machines - transformers, direct current machines, synchronous machines and induction machines, power in ac circuits, three-phase system, power system component modeling and analysis. At the end of the course, the students are expected to critically analyze the power system comprising of generation, transmission, and distribution components.

SEEE 2523 - Electromagnetic Field Theory
Pre-requisite: SSCE 1993 Engineering Mathematics 2
This course introduces students to some major views and theories in the area of electrostatic, magnetostatic and electromagnetic fields. This elementary electromagnetic field theory is summarized in Maxwell's equations. It is assumed that students already have appropriate mathematical background including multivariable calculus and some familiarity with the basic concepts typically covered in an introductory circuit theory course such as resistance, capacitance and inductance.

SEEE 2742 - 2nd Year Electronic Design Laboratory
All students will attend three second year laboratories which are the Electrotechnic, Basic Electronic and Digital Electronic Labs. The students will attend a three hour lab per week. The students are expected to complete four experiment topics for each lab in a direct of four week duration. Thus, the student will perform altogether 12 experiments in a semester. All experiments in the laboratories are emphasized on design case for a given complex engineering problem or project. The students will use software simulation tools to assist in their design tasks.

SEEE 3133 - System Modeling and Analysis
Pre-requisite: SEEE 2073 Signals & Systems
This course introduces the students to the fundamental ideas and definitions of control systems, open loop and close loop control systems, transfer functions and transient and steady state responses. Students will be taught how to obtain mathematical models of actual physical systems such as electrical, mechanical and electromechanical systems in the transfer function form. Methods of system representation such as block diagram representation and signal flow graphs will be discussed. The students will also be exposed to techniques of analysing control systems performance and stability in time and frequency domains. Finally, an introduction to the design and analysis of control systems using MATLAB will also be given.

SEEE 3143 - Control System Design
Pre-requisite: SEEE 3133 System Modeling and Analysis
The course begins with the root locus designs using root locus procedures and MATLAB. Then, PID controller will be designed using root locus approach. The PID controller and lead-lag compensator will be used to improve the transient and steady state performances in time domain using root locus approach. In frequency domain approach, the Bode plot method will be utilised. The lead, lag and lead-lag compensators are used in improving the performance of the control system using the frequency domain approach. Finally, applications of control engineering in various fields will be studied.

SEEE 3223 - Microprocessor
Pre-requisite: SEEE 1223 Digital Electronics
This course introduces the principles and applications of microprocessors. Topics emphasized are processor architecture, assembly and HLL language and fundamentals of interfacing in a microprocessor-based embedded system. This course emphasizes on the understanding the fundamentals of microprocessor operation, writing coherent and error-free assembly and HLL language programs, and designing basic interfacing circuits. With the knowledge learned, the student would be able to design microprocessor-based systems using assembly language and HLL programs completely with confidence.

SEEE 3263 - Electronic Systems
Pre-requisite: SEEE 1073 Electronic Devices and Circuits
This course covers some topics in functional electronic circuits. The circuits are derived from a diverse electronic circuitry that exists in many electronic instrumentation. The function, the behaviour and the characteristics of the functional circuits are analysed. Design examples are presented to guide students with the necessary knowledge of how to design the functional electronic circuits based on certain predetermined specifications.

SEEE 3533 - Communication Principles
Pre-requisite: SEEE 2073 Signals & Systems
This course introduces the students the basic principles of communication system. The fundamental concepts of analogue modulation in particular amplitude and frequency modulations will be strongly emphasized. Topics include types of modulated waveforms, transmitter and receiver structures, and noise performance. The two most significant limitations on the performance of a communications system; bandwidth and noise will be discussed. The concept of sampling, quantization and line coding techniques in rendering an information signal to be compatible with a digital system are explained prior to the study of coded pulse modulation and pulse code modulation (PCM). The waveforms and spectral analysis of bandpass digital modulations are introduced. The system performance in terms of SNR and bit error rate (BER) will also be covered. Finally, multiplexing, a method to utilize the communication resource efficiently is studied where two main multiplexing techniques will be explored; time-division and frequency-division multiplexing.

SEEE 3732 - Common Third Year Laboratory
Third Year Laboratory is a required course for third year students in Bachelor of Engineering degree program. This course requires students to conduct twelve experiments in six different laboratories (Basic Power, Basic Machine, Basic Communication, Instrumentation,

Microprocessor and Basic Control). The students are grouped into 3-4 students. Each week, they are required to conduct an experiment in the lab within 3 hours. Each group will submit only one short report at the end of each lab session. Each student is assigned to write only one long report based on one experiment that they have conducted for this course. This long report should be submitted within a week after the student performed the assigned experiment.

SEEE 4012 - Professional Engineering Practice

This course introduces and exposes the students to the concepts, theories and the practice of Professional Engineer. It highlights to the students profession of engineering, relevant acts and regulations, engineering code of ethics, engineers' roles and responsibilities, engineering ethics, the impact of the work of engineer on society, and knowledge to cater the needs for sustainable development. In terms of knowledge of accreditation of engineering programme and the internationalization of engineers, elements of EAC and Washington are also discussed. Based on this knowledge, the students will work on projects to analyze real engineering issues and cases, both individually and in groups.

SEEI 4233 - Nanotechnology and Application

In this course, students will be presented with concepts, opportunities and issues related to the nanoscale world. Students will be exposed to the fundamental principles of various equipment used in observing the nanoworld. Next, knowledge related to manipulation, characterization and fabrication of micro and nano objects will be discussed. Then, students will be exposed to the analysis of microfluidic device using finite element analysis (FEA) tool. Finally, students will be exposed to the design and development of microfluidic device using photolithography technique. In the end of the course, students are expected to acquire good understanding and able to analyse the fundamental principles of various equipment used in nanoworld. Students must be able to differentiate between various fundamental working principles used by various nano equipment. Furthermore, students should be able to use FEA and microfabrication tools to design and develop microfluidic device.

SEEL 3503 - Physiology and Introduction to Medicine

The course is designed for students with engineering and technical background as an introduction to the basics of anatomy and physiology. The course aims to prepare students with the basic knowledge for better interaction with medical practitioners when performing medical-related work or collaborative research.

SEEL 3613 - Semiconductor Material Engineering

Pre-requisite: SEEE 1073 Electronic Devices and Circuits

The purpose of this course is to provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices. In order to gain this understanding, it is essential to have a thorough knowledge of the basic physics and operation of the semiconductor material. The goal of this course is to bring together crystal structures, quantum mechanics, quantum theory for solids, semiconductor material physics, and fundamental of PN structures. All of these basic components are vital for students to understand the operation of present day and future electronic devices.

SEEL 3742 - Specialised 3rd Year Lab

3rd Year Laboratory is a required course for third year students in Bachelor of Engineering degree program. This course requires students to conduct four experiments in four different laboratories related to the chosen elective/specialization. The offered electives are Medical Electronics, Computer, Telecommunication, Microelectronics and Electronic System Design. The laboratories involved are Optical Communication, Microprocessor, Bioelectronics, Digital Communication, Microwave, VLSI and Advanced Electronics labs. This laboratory is conducted as a Project Based approach. The students are grouped into 3-4 students, and they will be given problems to solve that require them to conduct experiments in-lab and out-of-lab within three weeks. The students are required to solve the given project as a team, design suitable experimental procedures and conduct the experiments, present the problem solutions and submit a report following the IEEE standard journal format.

SEEL 4213 - Software Engineering

Pre-requisite: SECP 1103 C Programming Techniques

This course introduces various issues of system and software engineering. Focus is on software development process, program design, collaborative development and testing, which are the fundamental aspects of software engineering. Special emphasis will be given to object-oriented analysis and design (OOAD) as well as the use of UML in the design activities.

SEEL 4223 - Digital Signal Processing 1

Pre-requisite: SEEE 2073 Signal and System

This course introduces concepts in digital signal processing. Continuous-time signals and systems will be reviewed. Consecutively, introduction to digital signal processing, basic idea, benefits and applications are presented. Discrete-time signals and systems are described based on signal definition, periodicity, stability, causality, convolution, difference equations, infinite impulse response (IIR), finite impulse response (FIR) and signal flow graphs. Spectrum representation of discrete-time signals will cover sampling theorem, the discrete-time Fourier transform (DTFT) and its properties, and Discrete Fourier Transform (DFT). Another domain presented is Z-transform which consists of topics on derivations, region of convergence, transformation properties, poles and zeros, and inverse z-transform. At the end of the course, analysis and design of digital filters covers filter basics, analog filter prototypes and design of IIR filter and FIR filter.

SEEL 4273 - CAD with HDL

Pre-requisite: SEEE 2263 Digital Systems

This course introduces students to the use of computer-aided-design (CAD) tools and hardware description language (HDL) for the design of complex digital systems. Students will use CAD tools to model, design, analyze, synthesize, implement, and verify systems that are specified using the Register Transfer Level (RTL) methodology. Systems verification methods using scripts and testbenches will be introduced. Memory controller design and interfacing will be covered, including the use of RAMs, ROMs, Fifos, and external memory.

SEEL 4283 - Analog CMOS IC Design
Pre-requisite: SEEE 1073 Electronic Devices and Circuits
In this course students will be taught the characteristics of MOSFET transistor as a prerequisite of CMOS analog design. It highlights the nonlinearity as an imperfection, which will limit the performance of analog circuits. The course will then proceed to analyse CMOS single ended as well as differential amplifiers. The trademark of analog design, which is the design challenge to fulfil design matrix, will be highlighted. Students will be guided on design principles to meet design specifications with acceptable accuracy. Op Amp design will be addressed towards the end of the course.

SEEL 4293 - Advanced Digital Signal Processing
Pre-requisite: SEEL 4223 Digital Signal Processing 1
This course introduces students to advanced concepts in digital signal processing. Random variables are introduced starting with probability, random variables, probability density function and its operation. Random signal principles are presented with, definition of stationarity and ergodicity, correlation and covariance. The power spectrum of signals is defined together with the relationship with to the correlation function. Linear systems with random inputs are defined in terms of autocorrelation and cross correlation function and power spectrum. Optimum filtering techniques such as matched filter and wiener filter are presented with examples of applications. Linear estimation techniques deal with parameter identification and estimation of signals. Linear prediction is used for signal modelling and prediction. Towards the end of the course, signal analysis and representation techniques for time-varying signals are presented such as the short-time Fourier transform, Gabor transform and wavelet transform.

SEEL 4333 - Computer Architecture and Organization
Pre-requisite: SEEE 2263 Digital Systems
This course introduces students to the fundamental principles of computer architecture and its organization, emphasizing basic hardware/software components and functional architectures of computers. Computer organization and architecture is concerned with the structure and behavior of the various functional modules of the computer; and how they interact to provide the processing needs of the user. In particular, this course covers computer systems ranging from PCs through multiprocessors with respect to hardware design and instruction set architecture. This includes main memory, caches, central processing unit, and pipelines.

SEEL 4343 - Information Security
Pre-requisite: SEEE 1223 Digital Electronics
This course covers the basic principles and techniques used to protect information. The area covered begins with description of the various structure of communication systems in practice today, security architecture and models, issues related to legislation and ethics, and physical security. Consequently, the course will cover areas applicable to electronic and communication security with description of the various types of cipher systems followed by its use in authentication. Finally, applications in telecommunication, network and the internet are demonstrated.

SEEL 4363 - Digital Image Processing
Pre-requisite: SEEL 4223 Digital Signal Processing 1
This course introduces students to introductory and intermediate levels of image processing techniques. The area of coverage would be the digitization process as a mean to acquire the digital image. Next would be the enhancement and restoration processes which are to improve the quality of the image for next stage processing. Both the spatial domain and frequency domain approaches will be covered. The next stage would be the segmentation process. This is an important step towards advanced level processing. Finally the topic of compression and coding will be covered. MATLAB will be used extensively for better understanding. By adapting this knowledge, students will be able to develop essential technical skills in solving real-world problems involving image processing with some degree of accuracy.

SEEL 4373 - IC Testing Techniques
Pre-requisite: SEEE 2263 Digital Systems; SEEL 4283 Analog CMOS IC Design
This course introduces students to the techniques of testing a digital circuit and designing a testable digital circuit. Several fault models including single stuck-at fault model will be analyzed in details. Fault simulation methods are covered as well in this course. Test pattern generation and design-for-testability are also introduced to students. In order to facilitate learning process, computer-aided design (CAD) software is used throughout the course. Some practical or almost actual environment problems and solutions are provided.

SEEL 4513 - Clinical Engineering
Pre-requisite: SEEL 3503 Physiology and Introduction to Medicine
The course introduces major principles of clinical engineering which includes pre-market, market and post-market life-cycle of medical devices, as well as risk and personnel management and also the underlying principles involved in the measurement of certain physiological parameters from some of the complex organ system. Course content focuses on procurement planning, incident investigation, equipment management, productivity, cost effectiveness, information systems integration, and patient safety activities. Students will also be exposed to the related law, standards and regulations for medical devices.

SEEL 4523 - Medical Instrumentation
Pre-requisite: SEEE 2133 Electronic Instrumentation and Measurement
This course introduces students to various medical devices that can be found in hospitals and medical institutions. The course also includes discussions on circuits and features for ECG and EEG systems, blood pressure measurements, blood flow measurements, intensive care unit, operating room and elctrosurgery. The function behaviour and characteristics of the biomedical equipment are analysed and the necessary design criteria are discussed. Amplifier design examples are presented to guide students with necessary knowledge of how to control the circuit parameters for behaviours and characteristics so that the circuits can perform to the best of their intended functions.

SEEL 4533 - Biomedical Signal Processing
Pre-requisite: SEEL 4223 Digital Signal Processing 1
Manual analyses of biomedical signals has many limitations and very subjective. Therefore, computer analysis of these signals is essential since it can provide accurate and permanent record of diagnosis as well as quantitative measurement. Hence, this course presents

methods of digital signal processing for biomedical signals. The course will discuss the fundamental and current approach of biomedical signal processing, the removal of artifacts from biomedical signals, the time domain and frequency domain characterization of the biomedical signals, as well as an introduction to analysis of nonstationary and multicomponent biomedical signals. To complete the biomedical signal processing, an introduction to pattern classification for decision making is also introduced.

SEEL 4543 - Bio System Modelling
Pre-requisite: SEEL 3503 Physiology and Introduction to Medicine
The objective of this course is to introduce students to the mathematical model, methods and their biological application, and model of subsystem in human body. This course introduces students to some major views and theories in modeling the subsystem in human body. It is almost impossible to cover all subsystems in human body. As guidance, topics may include: the maintenance of cell homeotasis, excitation and conduction in nerve fibres, synaptic transmission and the neuromuscular junction, properties of muscles, the lung - physical and mechanical aspects of respiration, volume and composition of body fluids - the kidney, the cardiovascular systems, the heart as a pump, neural control of the heart and circulation, and the autonomic nervous system. The course will also provide practice in carrying out a computer simulation and modeling of bio system using Octave/Scilab/Matlab/Simulink/LabView software.

SEEL 4553 - Medical Imaging
Pre-requisite: SEEL 4223 Digital Signal Processing 1
This course introduces and exposes the students to the world of medical imaging technologies. Besides the basic principles, signal and systems, the course is also focusing into some medical image processing and analyses on the image obtained from the various imaging modalities such as X- Ray, CT- Scan , MRI, Nuclear Medicine and Ultrasound.

SEEL 4563 - Biosensors and Transducers
Pre-requisite: SEEE 2133 Electronic Instrumentation and Measurement
This course is intended to provide a broad introduction to the field of biosensor and transducer in the bioelectronic industry. Fundamental applications of biosensor theory are discussed, including birecognition, transduction and signal acquisition/processing. Design and fabrication of different types of biosensor are explored, ranging from electrochemical to optical system. Discussions on the current state of the art biosensor technology to enable continuation into advanced/future biosensor and the applications in biomedical, bioenvironmental, food safety and biosecurity are given.

SEEL 4573 - Rehabilitation Engineering
Principles and applications of rehabilitative assessment and therapy, with special focus on the use of technology to enhance access and consideration of the continuum of rehab care as an optimization problem. Overview of sensorimotor systems, as related to human performance and usability analysis. Models for access engineering and telerehabilitation, with focus on accessible design strategies, telemonitoring and teletherapy, and wireless and augmentative communication technologies. Rehabilitation biomechanics of interfaces for seated mobility

and for manipulation tasks. Innovations in assessment and intervention strategies for neurorehabilitation.

SEEL 4613 - Semiconductor Device Engineering
Pre-requisite: SEEL 3613 Semiconductor Material Engineering
The objective of this course is to provide students the physical principles underlying semiconductor device operation and the application of these principles to specific devices. Semiconductors form the basis of most modern electronics systems. It also provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices. It is essential to have a thorough knowledge of the physics of the semiconductor material. The goal is to bring together quantum mechanics, the quantum theory of solids, semiconductor material physics and semiconductor device physics. All of these components are vital to the understanding of both the operation of present day devices and any future development in the field. By adapting this knowledge, students will be able to develop the required technical skills in solving problems that arise from scaling down of semiconductor devices and in designing new device structures to overcome the challenges. This course is a continuation to Semiconductor Material Engineering course and focuses more on basic and advanced devices.

SEEL 4623 - Solid-State Electronic Devices
Pre-requisite: SEEL 3613 Semiconductor Material Engineering
The objective of this course is to introduce students to the basics of semiconductor hetero-structures and their applications for electronic devices. This is a continuation of semiconductor material engineering and electronic device courses. In this course, student will be exposed to the basic theories of hetero-structures and their applications for electronic and opto-electronic devices including memories. Specifically, students are exposed to the major types of gallium arsenide (GaAs) and gallium nitride (GaN)-alloyed semiconductors, their physical properties and their structures which make them suitable for electronic and opto-electronic devices. Heterojunction bipolar transistors and modulation-doped field effect transistors will be used to describe the basic characteristics needed for electronic device operation. Then, semiconductor lasers will be used as an example to explain the required characteristics for opto-electronic devices.

SEEL 4633 - Micrelectronic Device Fabrication and Characterization
Pre-requisite: SEEL 3613 Semiconductor Material Engineering
The objective of this course is to introduce students to the basics of semiconductor fabrication and characterization techniques that are relevant for micro devices in the field of electronics. The course will focus on the basic physical phenomenon and underlying technologies that involved in each fabrication process, with an emphasis on modern silicon-based micro device process flow. For device fabrication, students are exposed to mainly the top-down approaches which include wafer preparation, pattern transfer and doping technologies. For device characterization, basic electrical and optical techniques as well as physical characterization using microscopy technologies will be described.

SEEL 4643 - Nanoelectronics

The purpose of this course is to provide a basis for understanding nanotechnology as enabling sciences and technology in the field of nanoelectronics. In order to gain insight of this course, it is vital to have a thorough knowledge in basic materials science and solid state physics. The goal of this course is to bring together crystal structures, quantum mechanics, fundamental quantum mechanics expression, molecular electronics, quantum wells, 2-D electron gas and high electron mobility transistors (HEMT), resonant tunnelling, ballistic transistors and optical devices. All of these quantum devices are significant for students to comprehend the theoretical and practical challenges in designing such devices in order to prolong the scaling of present devices into the future.

SEEL 4653 - Modelling and Simulation of Microelectronic Devices

This course offers an introduction to modeling and simulation of microelectronic devices. Today, computer-aided design has become an affordable and in fact necessary tool for designing contemporary devices. The purpose of this course is to provide fundamental device modeling techniques with emphasis on the silicon metal-oxide-semiconductor field- effect-transistor (MOSFET). Examples on modeling carbon-based materials such as carbon nanotubes and graphene are also explored. There are discussions on crystal structure of solid, quantum system, carrier transport properties in 3D, 2D and 1D system. The goal of this course is to provide fundamental concepts and basic tools for transistor-level simulation that can be enhanced for circuit simulation.

SEEL 4663 - Embedded Processor System

Pre-requisite: SEEE 3223 Microprocessor; SECP 1103 C Programming Techniques

This course is about microprocessors in embedded systems. This course extends the students' knowledge of microprocessors by investigating embedded systems design and state-of-the-art 32-bit embedded processors. The student will be familiarized with problems associated with producing hardware and software in high-level language. The topics covered include high-level programming for SoC, achieving high-performance in embedded systems through multi-threading over multi-core processors, code optimization, power management and operating system fundamentals. This course has a strong emphasis on hands-on hardware/software development, whereby the student will have to develop a solution on the test development board.

SEEL 4673 - DSP Architectures

Pre-requisite: SEEE 2263 Digital Systems

This course introduces students to hardware implementation of digital signal processing (DSP) algorithms. DSP applications typically require high performance at tight space and power constraints. The requirements are best met by implementing DSP algorithms on application specific integrated circuits (ASIC) or field-programmable gate arrays (FPGA). This course exposes students to the modeling of common DSP algorithms, mapping of algorithms to hardware, various architectural styles and implementation issues.

SEEL 4723 - Capstone Project

The course provides students with the opportunity to integrate technical knowledge and generic skills attained in the earlier years. This is to be achieved within the context of an engineering project conducted in a small team (typically three or four students) under the supervision of an academic staff and with optional of industry partner as advisor. Topics supplementing this course that include project management tools and practices, organizational structures, engineering standards as well as the social and environmental responsibility of professional engineers are covered in the Professional Ethics and/or Engineering Management courses offered prior to or concurrent with the course.

SEEL 4743 - Basic Digital VLSI Design

Pre-requisite: SEEE 2263 Digital Systems

The objective of this course is to introduce students to basic techniques to design and implement digital VLSI system. This course introduces students to VLSI technology. A historical perspective on the evolution of integrated circuit technology is covered. Important issues when designing a VLSI circuit are discussed. MOS transistors are studied in detail, including their characteristics, structure, switch-level behaviour, and current equation. SPICE model of a MOS transistor is also described. The simplest circuit, an inverter, is studied in detail. Its voltage-transfer characteristic, noise margin and how to control the inversion point is investigated. How an IC is fabricated is described. Fabrication processes are elaborated. Layout, design rules and stick diagram are explained. This course teaches how to design circuits. Several logic families will be introduced. Advantages and disadvantages of each logic design style are explained. Delay and power performance of each logic family is also compared. Latch and flip-flop circuits are also covered. Interconnect issues, when various components are connected, are elaborated.

SEEL 4812 - Final Year Project 1

The aim of the Final Year Project 1 (FYP1) is to provide students the opportunity to demonstrate their knowledge learned at the FKE through the design and implementation of an engineering project. Students are exposed to identify and formulate research literature in understanding research problems. The final year project proposal will include the concept of sustainable development and project cost estimation. This will help students to learn important skills in solving practical engineering problems by applying a systematic design approach.

SEEL 4824 - Final Year Project 2

Pre-requisite: SEEL 4812 Final Year Project 1

The aim of the Final Year Project 2 (FYP2) is to provide students the opportunity to explore and implement creative and innovative knowledge to solve practical science, mathematical and engineering societal problems. Students are exposed to project management planning and execution. With these skills, it is hoped that the students will gain knowledge and experience in planning, designing and solving problems systematically thus when they graduate, they will be ready to work as reliable and productive engineers.

SEEM 4173 - Artificial Intelligence

Artificial intelligence (AI) involves the development of algorithms derived from human and animal intelligence that have capabilities such as learning, reasoning, generalization, adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many domestic and industrial products and provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) and Particle Swarm Optimization (PSO), and how they are used as a stand-alone approach or in any combination of the methods in solving engineering and non-engineering problems.

SEET 3573 - Microwave Engineering

Pre-requisite: SEEE 3533 Communication Principles

To introduce the basic theory of Microwave Engineering, such as transmission line theory, scattering parameters, Smith Chart, and impedance matching. Fundamental microwave devices, such as waveguides and resonators are explained. The students are also introduced to passive and active microwave components such as terminations, couplers, power dividers/combiners, circulators, amplifiers, oscillators, travelling wave tubes, filters, and microwave solid-state devices. Fundamentals in microwave instruments and measurement techniques are introduced.

SEET 3583 - Digital Communication System

Pre-requisite: SEEE 3533 Communication Principles

This course provides an introduction to fundamental concepts in digital communication system. Main topics to be covered are baseband pulse transmission, signal space analysis, digital modulation/demodulation, channel coding, source coding, detection methods and evaluation in AWGN channel. Fundamentals on error control coding is also included. Finally, the system trade-off in designing a digital communication system is explored.

SEET 3623 - Data Communication and Network

Pre-requisite: SEEE 3533 Communication Principles

The objective of the subject is to enhance the students' knowledge on data communication and computer networks. It explains the basic process of data communication, protocol, interfacing and inter-working between computer networks and switching components in telecommunication system. At the end of the course, the students should be able to understand the system used in representation, distribution, transmission and reception of data in data communication network.

SEET 4533 - Wireless Communication Systems

Pre-requisite: SEET 3573 Microwave Engineering

This course introduces students the concept and principle of mobile radio communication and satellite communication system. Topics covered include mobile radio propagation, multiple access, cellular concept, modern wireless communication systems and satellite communication systems.

SEET 4543 - RF Microwave Circuit Design
Pre-requisite: SEET 3573 Microwave Engineering
This course introduces students to the concept of designing RF/Microwave circuit in wireless communication system such as filters, amplifiers, oscillators and mixers. The design of the RF/Microwave circuit is based on the discrete components and the S-parameter of the component. The system block diagram is also discussed such as transmitter and receiver function and noise in communication system. The filter design is based on the lump component and the resposnse of the filter such as Butterworth and Chebyshev response. The matching concept is discussed further in the RF/Microwave amplifier and oscillator design using Smith chart. The analysis of the different mixer is also discussed in this subject.Simulation software CST will also introduced to facilitate learning process.

SEET 4593 - Acoustic Engineering
Pre-requisite: SEET 3533 Communication Principles
This course embodies the basic principles of fundamentals of acoustics engineering. The aim is mainly to instil confidence and apply the basic concepts, theories and applications in acoustics, noise control, room acoustics and sound system design. The course provides an in depth understanding of the characteristics, propagations, transmission and attenuation of sound waves. Further, noise criteria and control of interfering noise, sound absorption and reflection shall follow. The last part of the course cover on good room acoustics and sound system design for an enclosed room. At the end of the course, the students shall be able to apply the acoustics engineering fundamentals and concept in designing enclosed room for optimum acoustics and sound system.

SEET 4613 - Antenna Theory and Design
Pre-requisite: SEET 3573 Microwave Engineering
This course introduces students the concept of antenna, theory and design in telecommunication system. The basic antenna properties such as gain, polarization, directivity, efficiency, and radiation pattern for various types of antenna will be discussed. Several antennas with specific characteristic will be designed using simulation software and analysed. Finally, the antenna measurement setup is introduced and discussed.

SEET 4623 - Network Programming
Pre-requisite: SEET 3623 Data Communication and Networks
The objective of this course is to introduce students to the basic of network programming, in the networking implementations. This course will provide the students with understanding of socket programming to interconnect computers in network. The module will cover topics such as treads, input-output streams, handling errors and exceptions in socket programming. By the end of the module, students should have an understanding of interfacing between client and server.

SEET 4633 - Coding of Multimedia Signals
Pre-requisite: SEET 3583 Digital Communication System
This course is an introduction to the coding and processing of digital multimedia signals. It covers current techniques for coding of multimedia signals such as audio, images, and video. Current video compression standards and formats will be discussed and introduced in this

course. It focuses on the challenges of mobile video communication and provides methods in solving the issues.

SEET 4643 - Optical Materials and Sensors
Pre-requisite: SEET 4523 Optical Communication System
The aim of this course is to introduce students to the theories, concepts, instrumentation and device design for optical sensors. At the beginning, the course prepares students with essential knowledge of materials including the intrinsic dielectric and magnetic properties. The topics are established from the well known Maxwell's equations. Afterward, it explores various forms of optical waveguides, their important parameters and methods of analysis. The course then introduces students to various characterization instrumentations for optical waveguides. Finally, students are exposed to the design process of optical sensing devices for specific sensing applications.

SEET 4653 - Measurement and Characterization of Optical Devices
Pre-requisite: SEET 4523 Optical Communication System
Measurement and characterization of optical devices is essential for developing and characterizing today's photonic devices and fiber optic systems. This course brings together the fundamental principles with the latest techniques as a complete resource for the optical and communications engineer developing future optical devices and fiber optic systems. It covers the description and fundamental operation of passive and active devices required for the implementation of optical communication system. The main aspect covered will be the thorough understanding of the various performance parameters and specifications of these devices. The instrumentation covered will be Optical Spectrum analyser (OSA), Power Meter, Tunable Laser Source (TLS), Optical time-domain Reflectometer (OTDR) and optical attenuators. Measurement standards and test procedures adopted by the relevant authorities will also be covered.

SEET 4663 - Optical Network
Pre-requisite: SEET 4523 Optical Communication System
The course on Optical Network covers the basic aspects of optical networking, which is the key for today's high-speed data transportation technology. The course introduces several important optical network components (e.g. optical transmitters, detectors, amplifiers, multiplexers, filters, couplers, isolators, wavelength converters and cross-connects) that support the provisioning of high-speed light paths between optical nodes. The course also highlights approaches for ensuring the survivability of provisioned light paths and methods for analysing the topological properties of optical networks.

SEEL 5123 - Advanced Microprocessor System
This course is about microprocessors in embedded systems. This course extends the students' knowledge of microprocessors by investigating embedded systems design and state-of-the-art 32-bit embedded processors. The student will be familiarized with problems associated with producing hardware and software in high-level language and assembly language for embedded systems. The topics covered include high-level (C/C++ programming) and assembly language programming for embedded microprocessors, memory and

peripherals for embedded systems, system development, embedded real-time operating systems and optimizing performance of embedded systems.

SEET 5313 - Communications and Computer Networks
This course will enhance the students' knowledge on communication and computer network. It explains the advance concept of network layers, protocols, interfacing and inter-working between computer networks and network devices in telecommunication systems. The students will be taught with the various possible techniques to understand the modern networks for wired and wireless services.

SEET 5413 - Advanced Digital Communication
This course provides fundamental concepts in the analysis and design of digital communication system. Main topics to be covered are introduction to information theory, signal space analysis, digital modulation/demodulation over AWGN channel, baseband transmission over bandlimited channel, channel coding, error control coding. Finally, the system trade-off in designing a digital communication system in AWGN channel is explored.

SEEL 5113 - Advanced Nanoelectronics Devices
Semiconductors form the basis of most modern electronics systems. This course is designed to provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices. In order to gain this understanding, it is essential to have a thorough knowledge of the physics of the semiconductor material. The goal is to bring together quantum mechanics, the quantum theory of solids, semiconductor material physics, and semiconductor device physics. All of these components are vital to the understanding of both the operation of present day devices and any future development in the field. This course is a continuation to Microelectronics at undergraduate level and introduces advance device concepts.

SEEL 5193 - Advanced Analog CMOS IC Design
This course introduces students to the advanced level of CMOS design in analog circuits. In the beginning, it highlights the operational concept of MOSFET transistors and their nonlinearity characteristics that will limit the performance of analog circuits. The course will then proceed to analyze CMOS single ended as well as differential amplifiers. The advantages and disadvantages between different architectures will be discussed. The trademark of analog design which is the design challenge to fulfill design matrix will be emphasized. Students will be guided on design principles to meet design specifications with acceptable accuracy. Important sub-modules differential amplifier and op amps will be studied in detail towards the end of the course.

SEEM 5753 - Advanced Instrumentation and Measurement
This course is an introduction to the advanced instrumentation and measurement. Key components studied in details are a review of powerful measurement techniques and basic principles and typical problems of sensor elements, detailed up-to-date reviews of the features of temperature sensors, displacement sensors, flow sensors, level sensors, position sensors, motion sensors and biometrics. This course also provides a detailed knowledge on error and determination of uncertainties in measurement. Besides that, this course introduces the multi sensor, Fusion application, wireless sensor network and Internet of Things. Finally, the basic

concepts of safety instrumented system, standards and risk analysis techniques will be discussed.

SEEM 5713 - Artificial Intelligence and Applications
Artificial intelligence (AI) involves the development of algorithms derived from human & animal intelligence that have capabilities such as learning, reasoning, generalization, adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many domestic & industrial products & provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) & Particle Swarm Optimization (PSO), & how they are used in solving engineering & non-engineering problems.

SEEM 5703 - Control Systems Engineering
This course introduces the students to the fundamental concepts of control systems engineering. Students will be exposed with techniques of modelling of physical systems involving linear and nonlinear systems including mechanical, electrical and mechatronic systems. Both the frequency domain and time domain (state-space) are covered. Several criteria for performance and stability analyses of control systems will be taught. Modelling and analysis of control system in discrete time for digital control will also be introduced. Student will also be exposed with MATLAB for design, development and analysis of simulation models. Finally, a feedback control system with controller to achieve control system objectives are described. Several case studies of the applications of controllers will be used to enhance the student understanding.

SEET 5313 - Communications and Computer Networks
This course will enhance the students' knowledge on communication and computer network. It explains the advance concept of network layers, protocols, interfacing and inter-working between computer networks and network devices in telecommunication systems. The students will be taught with the various possible techniques to understand the modern networks for wired and wireless services.

SEET 5513 - Sustainable Design, Engineering and Management
The aim is to give students an insight and understanding of the environmental and sustainability challenges that are facing by Communication Engineers and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy, Life Cycle Assessment (LCA) and green technology. Students will also experience conducting case studies and project-based learning encompassing four themes in sustainability which are connecting, conceptualizing, valuing and implementing.

SEET 5423 - Wireless Communication Systems
This course introduces students to introductory and advanced level of wireless communication technologies. In the beginning students will be presented with the concept of wireless communication systems and mobile radio propagation. Students will then be illuminated on

MIMO technology in mobile communication. Next, the course will describe on cellular concepts that will include small cell networks. This is followed by details on the overall evolution of mobile communication system. Finally, this course will cover on different multiple access techniques used in wireless communication systems.

SEET 5523 - Internet of Things Technology

The course provides students with a technical background to the Internet of Things (IoT) which includes its concept, architecture and applications. It also gives the underlying communication protocols and technologies. The course has a significant practical element that will be delivered during lab sessions in which students are expected to complete exercises involving system design, device programming and cloud development.

BACHELOR OF ENGINEERING (ELECTRICAL-MECHATRONICS)

PROGRAMME SPECIFICATIONS

The Bachelor of Engineering (Electrical-Mechatronics) is a program with honours that has been established and offered for more than two decades by UTM. The program is a four-year program completed with one year final year project. The programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Engineering (Electrical - Mechatronics)	
4. Final Award			Bachelor of Engineering (Electrical - Mechatronics)	
5. Programme Code			SEEM	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study (Conventional, distance learning, etc)			Conventional	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum : 4 yrs Maximum : 6 yrs	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	18	-
Short	4	-	10	-

Course Classification

Bachelor of Engineering (Electrical - Mechatronics) - SEEM

No	Classification	Credit Hours	Percentage
i.	University Courses a) General b) Language c) Entrepreneurship d) Co-Curriculum	 26 8 2 3	 28.7%
ii.	School/Programme Core	88	64.7%
iii.	Programme Electives	9	6.6%
	Total	**136**	**100%**
A	Engineering Courses a) Lecture/Project/Laboratory b) Workshop/Field/Design Studio c) Industrial Training d) Final Year Project	 83 2 6 6	 71.3%
Total Credit Hours for Part A		**97**	
B	Related Courses a) Applied Science/Mathematic/Computer b) Management/Law/Humanities/Ethics/Economy c) Language d) Co-Curriculum	 17 11 8 3	 28.7%
Total Credit Hours for Part B		**39**	
Total Credit Hours for Part A and B		**136**	100%
Total Credit Hours to Graduate		**136 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 136 credit hours (SEEM) with a minimum CGPA of 2.0.
- Complete Professional Skills Certificates (PSC).

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Become Electronic Engineers who are competent, innovative, and productive in addressing customer needs.
PEO2	Grow professionally with proficient soft skills.
PEO3	Demonstrate high standards of ethical conduct, positive attitude, and societal responsibilities.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Ability to apply knowledge of mathematics, science and electrical/electronic engineering to the solution of complex engineering problems.
PLO2	Ability to perform research-based analysis, conduct experiments and interpret data for complex engineering problems.
PLO3	Ability to identify, formulate, conduct research literature to analyse complex engineering problems using engineering knowledge.
PLO4	Ability to apply engineering practice and use modern engineering, and IT tools for complex engineering problem with an understanding the limitations of the technology.
PLO5	Ability to design solutions for complex engineering problems and design systems and processes that meet specified needs with appropriate consideration for public health and safety, culture, society, and environment.
PLO6	Ability to articulate ideas, communicate effectively, in writing and verbally, on complex engineering activities with the engineering community and with society at large.
PLO7	Ability to function effectively as an individual, as a member or as a leader in diverse teams.
PLO8	Ability to recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PLO9	Ability to comprehend the impact of global and contemporary issues, the role of engineers on society including, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practices and engineering problems.
PLO10	Ability to comprehend and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts.
PLO11	Ability to grasp and execute responsibility professionally and ethically in professional engineering practices.
PLO12	Ability to demonstrate knowledge and understanding of engineering and management principles, and economic decision-making to manage projects in multidisciplinary environments.

PROFESSIONAL SKILLS CERTIFICATE (PSC)

New PSC courses are introduced to new and current students starting from Session 2020/2021. Students are required to undertake and pass Five (5) Professional Skills Certificate (PSC) courses of UTM Institute for Life Ready Graduate (UTM ILeague). These courses are offered and managed by School of Professional and Continuing Education (SPACE) in collaboration with Schools or Faculties. Students are required to register the courses through SPACE Website.

List of PSC courses are as follows:

No.	PSC COURSE	OFFERED AND MANAGED BY SPACE IN COLLABORATION WITH
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	UTM Excite
2	Talent and Competency Management	UTM Career Centre (UTMCC)
3	English Communication Skills for Graduating Students (ECS)	Language Academy
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	Faculty of Engineering (FE)
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	Schools or Faculties at UTM

COURSE MENU

Bachelor of Engineering (Electrical-Mechatronics) - SEEM

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 1693	Engineering Mathematics I	3	
SEEE 1012	Introduction to Electrical Engineering	2	
SEEE 1013	Electrical Circuit Analysis	3	
SECP 1103	C Programming Techniques	3	
UHLB 1112	English Communication Skills	2	
UHMS 1182	Appreciation of Ethics and Civilizations (Local Students)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students)		
	TOTAL CREDIT	**15**	
	CUMULATIVE CREDITS	**15**	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 1793	Differential Equations	3	
SEEE 1073	Electronic Devices and Circuits	3	SEEE 1013
SEEE 1223	Digital Electronics	3	
SEEM 1113	Engineering Mechanics	3	
SEEM 1502	Computer Aided Engineering Drawing	2	
UHIS 1022	Philosophy and Current Issues (for Local Students)	2	
UHLM 1012	Malay Language for Communication 2 (International Students)		
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**31**	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
SEEE 1022	Introduction to Scientific Programming	2	
SEEE 2073	Signals and Systems	3	
SEEE 2423	Fundamentals of Electrical Power Systems	3	SEEE1013
UHMT 1012	Graduate Success Attributes	2	
UHLB 2122	Academic Communication Skills	2	
UKQF 2**2	Elective of Co-Curriculum Service Learning	2	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**48**	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 2193	Engineering Statistics	3	
SEEE 2133	Electronic Instrumentation & Measurement	3	
SEEE 2263	Digital Systems	3	SEEE 1223
SEEM 3123	Hydraulic and Pneumatic Systems	3	SEEM 1113
SEEE 2742	2nd Year Electronic Design Lab	2	
UBSS 1032	Introduction To Entrepreneurship	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**64**	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 2393	Numerical Methods	3	
SEEE 3133	System Modeling & Analysis	3	SEEE 2073
SEEE 3223	Microprocessor	3	SEEE 1223
SEEE 3533	Communication Principles	3	SEEE 2073
SEEE 2523	Electromagnetic Field Theory	3	SSCE 1993
SEEE 3732	Common 3rd Year Laboratory	2	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	81	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3143	Control System Design	3	SEEE 3133
SEEE 3263	Electronic Systems	3	SEEE 1073
SEEM 3133	Electrical Motors and Drives	3	
SEEM 4333	Mechatronics System Design	3	
SEEM 3742	Specialized 3rd Year Laboratory	2	
UHLB 3132	Professional Communication Skills	2	
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	**17**	
	CUMULATIVE CREDITS	**98**	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SEEM 4926	Practical Training	6	
	TOTAL CREDIT	**6**	
	CUMULATIVE CREDITS	**104**	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEM 4723	Capstone Project	3	
SEEM 4812	Final Year Project Part I	2	
SEEM 4143	Robotics	3	SSCE 1993
SEEL 4223	Digital Signal Processing I	3	SEEE 2073
SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	
SHMS 4542	Engineering Management	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**120**	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEM 4824	Final Year Project Part II	4	SEEM 4812
SEEE 4012	Professional Engineering Practice	2	
SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	
SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	

UHIT 2302	Science and Technology Thinking	2	
UHL* 1112	Electives of Foreign Language	2	
	TOTAL CREDIT	**16**	
	CUMULATIVE CREDITS	**136**	

Elective Courses

Code	Course	Credit	Pre-requisite
SEEE 4113	Modern Control System	3	SEEE 3143
SEEE 4153	Digital Control Systems	3	SEEE 3143
SEEE 4433	Power Electronic and Drives	3	SEEE 2423
SEEI 3133	Industrial Instrumentations and Applications	3	SEEE 2133
SEEI 4173	Advanced Transducers and Sensors	3	SEEI 3133
SEEI 4223	BioMEMS and Microanalytical Systems	3	SEEI 3133
SEEI 4233	Nanotechnology and Application	3	
SEEI 4313	PLC and SCADA System Design	3	SEEE 3143
SEEI 4323	Advanced Control Theory	3	SEEE 4113
SEEI 4343	System Identification and Estimation	3	SEEE 4113
SEEI 4363	Industrial Control Networks	3	SEEE 3143
SEEL 4213	Software Engineering	3	SECP 1103
SEEM 4133	Machine Vision Systems	3	
SEEM 4153	Robot Technology for Automation	3	SEEM 4143
SEEM 4173	Artificial Intelligence	3	
SEEM 4223	Embedded Systems	3	SEEE 3223
SEET 4633	Coding of Multimedia Signals	3	SEET 3583
SEEM 4163	Autonomous Robot	3	SEEM 4143
SEEM 4123	Industrial Engineering	3	

SEEM Elective Courses for PRISM (CHOOSE MAXIMUM 3)			
Code	**Course**	**Credit**	**Pre-requisite**
SEEM 5753	Advanced Instrumentation and Measurement	3	
SEEM 5713	Artificial Intelligence and Applications	3	
SEEM 5703	Control Systems Engineering	3	

PRISMS ELECTIVE COURSES

For students who intend to enroll into PRISMS programme, refer to the PRISMS Section for a list of related elective courses associated with the postgraduate programmes.

Requirements

Students who are eligible to apply for PRISMS are those with academic qualification who are in Year 3 Semester 2 with cumulative average grade value of CGPA 3.3 and above. Students can apply for PRISMS in Year 3 Semester 2 through the Program Integrasi Sarjana Muda-Sarjana (PRISMS) application form and must be recommended by the Academic Advisor, approved by the Program Director and certified by the Chair of School or Dean of Faculty.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

Bachelor of Engineering (Electrical - Mechatronics) - SEEM

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√)IF PASSED
BACHELOR OF ENGINEERING (ELECTRICAL – MECHATRONICS)					
1.	SEEE 1012	Introduction to Electrical Engineering	2	2	
2.	SEEE 1013	Electrical Circuit Analysis	3	3	
3.	SEEE 1022	Introduction to Scientific Programming	2	2	
4.	SEEE 1073	Electronic Devices and Circuits	3	3	
5.	SEEE 1223	Digital Electronics	3	3	
6.	SEEE 2073	Signals and Systems	3	3	
7.	SEEE 2133	Electronic Instrumentation & Measurement	3	3	
8.	SEEE 2263	Digital Systems	3	3	
9.	SEEE 2423	Fundamentals of Electrical Power Systems	3	3	
10.	SEEE 2523	Electromagnetic Field Theory	3	3	
11.	SEEE 2742	2nd Year Electronic Design Lab	2	2	
12.	SEEE 3133	System Modeling & Analysis	3	3	
13.	SEEE 3143	Control System Design	3	3	
14.	SEEE 3223	Microprocessor	3	3	
15.	SEEE 3263	Electronic Systems	3	3	
16.	SEEE 3533	Communication Principles	3	3	
17.	SEEE 3732	Common 3rd Year Laboratory	2	2	
18.	SEEE 4012	Professional Engineering Practice	2	2	

19.	SEEL 4223	Digital Signal Processing I	3	3	
20.	SEEM 1113	Engineering Mechanics	3	3	
21.	SEEM 1502	Computer Aided Engineering Drawing	2	2	
22.	SEEM 3123	Hydraulic and Pneumatic Systems	3	3	
23.	SEEM 3133	Electrical Motors and Drives	3	3	
24.	SEEM 3742	Specialized 3rd Year Laboratory	2	2	
25.	SEEM 4143	Robotics	3	3	
26.	SEEM 4333	Mechatronics System Design	3	3	
27.	SEEM 4723	Capstone Project	3	3	
28.	SEEM 4812	Final Year Project Part I	2	2	
29.	SEEM 4824	Final Year Project Part II	4	4	
30.	SEEM 4926	Practical Training	6	6	
31.	SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	3	
32.	SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	3	
33.	SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	3	
34.	SECP 1103	C Programming Techniques	3	3	
35.	SHMS 4542	Engineering Management	2	2	
		TOTAL CREDIT OF ENGINEERING COURSES(a)	**100**	**94**	
MATHEMATICS COURSES (Faculty of Science)					
1.	SSCE 1693	Engineering Mathematics I	3	3	
2.	SSCE 1793	Differential Equations	3	3	
3.	SSCE 1993	Engineering Mathematics II	3	3	
4.	SSCE 2193	Engineering Statistics	3	3	
5.	SSCE 2393	Numerical Methods	3	3	
		TOTAL CREDIT OF MATHEMATICS COURSES (b)	**15**	**15**	

UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1.	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			
2.	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
Cluster 2: Generic Skills					
1.	UHMT 1012	Graduate Success Attributes	2	2	
2.	UBSS 1032	Introduction to Entrepreneurship	2	2	
Cluster 3: Knowledge Enhancement					
1.	UHIT 2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1.	UKQF 2**2	Elective of Co-Curricular Service Learning	2	2	
2.	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1.	UHLB 1112	English Communication Skills	2	2	
2.	UHLB 2122	Academic Communication Skills	2	2	
3.	UHLB 3132	Professional Communication Skills	2	2	
4.	UHL* 1112	Elective Of Foreign Language	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**21**	**21**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**136**	**130**	

OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC). • **Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.** • **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**			
COMPULSORY PSC COURSES (Enroll all 4 courses)			
1	GSPX XXXX	Design Thinking for Entrepreneur	
2	GSPX XXXX	Talent and Competency Management	
3	GSPX XXXX	Faculty Engineering Safety Pass (FESP) *MODULE 1 - compulsory for SKM, SKT and SKE students* *MODULE 2 – compulsory for SKA, SC, SKBSK students*	
4	GSPX XXXX	English Communication Skills for Graduating Students (ECS)	
ELECTIVE PSC COURSE (Choose 1 only)			
1	GSPX XXXX	Data Analytics for Organization	
2	GSPX XXXX	Writing	
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical Works)	
4	GSPX XXXX	Professional Ethics and Integrity	
5	GSPX XXXX	More elective courses to be added in future	

COURSE SYNOPSIS

SEEE 1012 - Introduction to Electrical Engineering

This course serves as a general introduction to electrical engineering programmes offered by the School of Electrical Engineering (SEE), Universiti Teknologi Malaysia (UTM). Students undertaking this course will be exposed to attributes of electrical engineers from both academic and practical points of view. Soft skills and knowledge that are necessary in the engineering world will be introduced to the students. The students will have a clearer understanding on the responsibilities of electrical engineers to the society. By exploring contemporary issues, the students would be able to suggest sustainable solutions to the mankind and its environment.

SEEE 1013 - Electrical Circuit Analysis

This course introduces students to the basic laws, methods of analysis and theorems for direct current, DC and alternating current, AC circuit, such as, Ohms Law, Kirchhoff's Current and Voltage Laws, Mesh and Nodal Analysis and Thevenin's and Norton's Theorems. Based on these, the students are expected to be able to solve for variables in any given DC and AC electric circuits. The students also exposed to the steady-state electrical circuit. Afterwards, the relevant concepts in transient circuit analysis for first and second order circuit are taught to the students. With the knowledge learned, the student would be able to apply the basic laws, theorem and methods of analysis for solving completely with confidence various problems in circuit analysis.

SEEE 1022 - Introduction to Scientific Programming

This course introduces the fundamentals of scientific programming languages and techniques used by engineers to solve engineering problems. Students will be introduced to common scientific programming languages and their comparative advantages and disadvantages. Emphasis is placed on fundamentals of programming, program design, verification and visualization. The goal is to provide the students with the skills in scientific computing, tools, techniques that can be used to solve their own engineering problems. Students will learn to implement algorithms using high level programming language (e.g. MATLAB, Mathematica, FORTRAN). The programming skills acquired in this course will allow students to go beyond what is available in pre-packaged analysis tools, and code their own custom data processing, analysis and visualization for any engineering problem.

SEEE 1073 - Electronic Devices & Circuits

Pre-requisite: SEEE 1013 Electrical Circuit Analysis

This course provides introduction to the basic operating principles and applications of discrete electronic devices and circuits. The course content starts with the fundamental solid-state principles and continues the discussions with the constructions and characteristics of diode, Bipolar Junction Transistor (BJT) and Enhancement Metal Oxide

Semiconductor Field Effect Transistor (E-MOSFET). The application of diodes focuses on the basic power supply circuits whereas the applications of the transistors focus on the small-signal amplifier. The course content ends with an introduction to the operating principles of an ideal operational amplifier (op-amp) and discussion about op-amp circuits, performance and applications. To help the students understand the behaviour of the electronic devices and

predict the behaviour of the electronic circuits, this course makes use of Multisim simulation software. The goal of this course is to develop excellent understanding of the devices operation for students to be applied in analogue and digital circuit design.

SEEE 1223 - Digital Electronics

This course teaches the fundamental principles of digital systems. From the signal concepts and the importance of numbers systems and codes, it then proceeds to logic gates, their relationship to Boolean algebra and the integration of gates to form complex circuits. The course emphasizes on techniques to design, analyse, plan, and implement simple digital systems using gates and MSI circuits. Simulation software Quartus II version 13 will also be introduced to facilitate learning process.

SEEE 2073 - Signals and Systems

This course introduces the students the fundamental ideas of signals and system analysis. The signal representations in both time and frequency domains and their effects on systems will be explored. Specifically, the topics covered in the course include basic properties of continuous-time and discrete-time signals, the processing of signals by linear time-invariant (LTI) systems, Fourier series, Fourier and Laplace transforms. Important concepts such as impulse response, frequency response and system transfer functions as well as techniques of filtering and filter design, modulation, and sampling, are discussed and illustrated. This course will serve as a central building block for students in studying information processing in many engineering fields such as control systems, digital signal processing, communications, circuit design, etc.

SEEE 2133 - Electronic Instrumentation and Measurement

This course introduces students some of the metrological terminologies used in experimental methods, concept of metrology and its application. The course will also provide understanding the concept electrical measurement quantity using analogue and digital instruments. The interfaces of the instruments with embedded sensors and also the quality of the signals acquired are introduced. Besides that, this course also introduces the type of electrical noise and the ways to reduce noise and interference. Finally, the fundamental principle of transducers, transducer operations, characteristic and functions will be discussed. P&ID diagram also introduces to cover the basic process of the system.

SEEE 2263 - Digital Systems

Pre-requisite: SEEE 1223 Digital Electronics

This course is a continuation from basic digital logic techniques course. The objective of the course is to introduce students to basic techniques to design and implement complex digital systems It emphasizes on techniques to design, analyse, plan, and implement complex digital systems using programmable logic. To facilitate learning process, computer-aided design (CAD) software is used throughout the course. Actual environment problems and solutions are provided.

SEEE 2423 - Fundamentals Of Electrical Power Systems
Pre-requisite: SEEE 1013 Electrical Circuit Analysis
This course introduces fundamental concepts of electric machines and power system. Students should be able to identify components of the system from the course and describe their basic operations from the course having electromagnetic and circuit concepts learned in previous fundamental courses. These fundamental concepts are further elaborated in applications of electric machines - transformers, direct current machines, synchronous machines and induction machines, power in ac circuits, three-phase system, power system component modeling and analysis. At the end of the course, the students are expected to critically analyze the power system comprising of generation, transmission, and distribution components.

SEEE 2523 - Electromagnetic Field Theory
Pre-requisite: SSCE 1993 Engineering Mathematics 2
This course introduces students to some major views and theories in the area of electrostatic, magnetostatic and electromagnetic fields. This elementary electromagnetic field theory is summarized in Maxwell's equations. It is assumed that students already have appropriate mathematical background including multivariable calculus and some familiarity with the basic concepts typically covered in an introductory circuit theory course such as resistance, capacitance and inductance.

SEEE 2742 - 2nd Year Electronic Design Laboratory
All students will attend three second year laboratories which are the Electrotechnic, Basic Electronic and Digital Electronic Labs. The students will attend a three hour lab per week. The students are expected to complete four experiment topics for each lab in a direct of four week duration. Thus, the student will perform altogether 12 experiments in a semester. All experiments in the laboratories are emphasized on design case for a given complex engineering problem or project. The students will use software simulation tools to assist in their design tasks.

SEEE 3133 - System Modeling And Analysis
Pre-requisite: SEEE 2073 Signals & Systems
This course introduces the students to the fundamental ideas and definitions of control systems, open loop and close loop control systems, transfer functions and transient and steady state responses. Students will be taught how to obtain mathematical models of actual physical systems such as electrical, mechanical and electromechanical systems in the transfer function form. Methods of system representation such as block diagram representation and signal flow graphs will be discussed. The students will also be exposed to techniques of analysing control systems performance and stability in time and frequency domains. Finally, an introduction to the design and analysis of control systems using MATLAB will also be given.

SEEE 3143 - Control System Design
Pre-requisite: SEEE 3133 System Modeling and Analysis
The course begins with the root locus designs using root locus procedures and MATLAB. Then, PID controller will be designed using root locus approach. The PID controller and lead-lag compensator will be used to improve the transient and steady state performances in time domain using root locus approach. In frequency domain approach, the Bode plot method will

be utilised. The lead, lag and lead-lag compensators are used in improving the performance of the control system using the frequency domain approach. Finally, applications of control engineering in various fields will be studied.

SEEE 3223 - Microprocessor
Pre-requisite: SEEE 1223 Digital Electronics
This course introduces the principles and applications of microprocessors. Topics emphasized are processor architecture, assembly and HLL language and fundamentals of interfacing in a microprocessor-based embedded system. This course emphasizes on the understanding the fundamentals of microprocessor operation, writing coherent and error-free assembly and HLL language programs, and designing basic interfacing circuits. With the knowledge learned, the student would be able to design microprocessor-based systems using assembly language and HLL programs completely with confidence.

SEEE 3263 - Electronic Systems
Pre-requisite: SEEE 1073 Electronic Devices and Circuits
This course covers some topics in functional electronic circuits. The circuits are derived from a diverse electronic circuitry that exists in many electronic instrumentation. The function, the behaviour and the characteristics of the functional circuits are analysed. Design examples are presented to guide students with the necessary knowledge of how to design the functional electronic circuits based on certain predetermined specifications.

SEEE 3533 - Communication Principles
Pre-requisite: SEEE 2073 Signals & Systems
This course introduces the students the basic principles of communication system. The fundamental concepts of analogue modulation in particular amplitude and frequency modulations will be strongly emphasized. Topics include types of modulated waveforms, transmitter and receiver structures, and noise performance. The two most significant limitations on the performance of a communications system; bandwidth and noise will be discussed. The concept of sampling, quantization and line coding techniques in rendering an information signal to be compatible with a digital system are explained prior to the study of coded pulse modulation and pulse code modulation (PCM). The waveforms and spectral analysis of bandpass digital modulations are introduced. The system performance in terms of SNR and bit error rate (BER) will also be covered. Finally, multiplexing, a method to utilize the communication resource efficiently is studied where two main multiplexing techniques will be explored; time-division and frequency-division multiplexing.

SEEE 3732 - Common Third Year Laboratory
Third Year Laboratory is a required course for third year students in Bachelor of Engineering degree program. This course requires students to conduct twelve experiments in six different laboratories (Basic Power, Basic Machine, Basic Communication, Instrumentation, Microprocessor and Basic Control). The students are grouped into 3-4 students. Each week, they are required to conduct an experiment in the lab within 3 hours. Each group will submit only one short report at the end of each lab session. Each student is assigned to write only one long report based on one experiment that they have conducted for this course. This long report should be submitted within a week after the student performed the assigned experiment.

SEEE 4012 - Professional Engineering Practice

This course introduces and exposes the students to the concepts, theories and the practice of Professional Engineer. It highlights to the students profession of engineering, relevant acts and regulations, engineering code of ethics, engineers' roles and responsibilities, engineering ethics, the impact of the work of engineer on society, and knowledge to cater the needs for sustainable development. In terms of knowledge of accreditation of engineering programme and the internationalization of engineers, elements of EAC and Washington are also discussed. Based on this knowledge, the students will work on projects to analyze real engineering issues and cases, both individually and in groups.

SEEE 4113 - Modern Control System

Pre-requisite: SEEE 3143 Control System Design

This course introduces students the modern modeling approach of physical system namely state space. Students are introduced to state space modeling and analysis of several forms of state space representation, conversion and similarity transformation. Students are exposed to solution of state space equation, controller and observer design using pole placement method and optimal control system.

SEEE 4153 - Digital Control Systems

Pre-requisite: SEEE 3143 Control System Design

This course introduces students the basic principles underlying the analysis, synthesis and design of digital control systems. Students are introduced to sampling theorem and discretization of continuous time system, data reconstructions, z-transform, mathematical modeling of discrete-time and digital systems, time domain and various stability analysis methods for discrete-time and digital systems, and on the design of various discrete-time and digital controllers. By adapting the knowledge obtained, students will be able to derive the mathematical model of discrete-time control systems and analyze accurately its stability and the time response, as well as the students will be able to design correctly the suitable digital controller to control the discrete-time systems.

SEEE 4433 - Power Electronics and Drives

Pre-requisite: SEEE 2423 Fundamentals of Electrical Power Systems

This course introduces students to the fundamentals of power electronics, which include power semiconductor switches, rectifier (AC-DC), choppers (DC-DC), and inverters (DC-AC). Emphasis will be on the power converter operations and analysis of their steady state performances. The course also exposes students to some basic converters design and the selection of suitable converters for certain application. In addition, the course covers the operation and selection of converters for DC and AC drive systems. At the end of the course student should be able to critically design power converters at given specification using application software.

SEEI 4233 - Nanotechnology and Application

In this course, students will be presented with concepts, opportunities and issues related to the nanoscale world. Students will be exposed to the fundamental principles of various equipment used in observing the nanoworld. Next, knowledge related to manipulation, characterization and fabrication of micro and nano objects will be discussed. Then, students will be exposed to the analysis of microfluidic device using finite element analysis (FEA) tool.

Finally, students will be exposed to the design and development of microfluidic device using photolithography technique. In the end of the course, students are expected to acquire good understanding and able to analyse the fundamental principles of various equipment used in nanoworld. Students must be able to differentiate between various fundamental working principles used by various nano equipment. Furthermore, students should be able to use FEA and microfabrication tools to design and develop microfluidic device.

SEEI 4313 - PLC and Scada System Design
Pre-requisite: SEEE 3143 Control System Design
This course is divided into parts: (1) Automation and (2) Scada system. This is an advance subject in control engineering for final year electrical engineering students. The main aim is to develop concepts in industrial control engineering to the students. Fundamental concepts in manufacturing and automation, building blocks of automation. Simple modeling and analysis process transducers and controllers, drivers and final control elements. Industrial logic control system, sequence control using electronic logic components and programmable logic controllers (PLC) in simple process, control system and automated control system. SCADA is the process of a plant and / or a method of gathering of data from devices in the field. This the process of collecting data into the actual business, and using it in real time. There are using standard communication protocols (eg IEC 60870, DNP3 and TCP/IP) and hardware and software. Many SCADA applications use PLCs as the RTU of choice,when communicating with field devices. This subject covers the essentials of SCADA and PLC systems, which are often used in close association with each other. A selection of case studies are used to illustrate the key concepts with examples of real world working SCADA and PLC systems in the water, electrical and processing industries.

SEEI 4343 - System Identification and Estimation
Pre-requisite: SEEE 4113 Modern Control System
This course is an introduction to the alternative modelling using system identification and parameter estimation approach. It covers an introduction to system identification technique, acquiring and pre-processing data, nonparametric model estimation methods, parametric model estimation methods, partially known estimation methods, model estimation methods in closed loop systems, recursive model estimation methods, analysing, validating, and converting models and system identification case study. This requires an in-depth understanding of control system engineering, modern control system and digital control system. The emphasis will be on the theoretical basis as well as practical implementations. Key components studied in details are time response analysis, frequency response analysis, correlation analysis, power spectrum density analysis, model structure, parametric model, parameter estimation method, test signals and model validation methods.

SEEI 4363 - Industrial Control Networks
Pre-requisite: SEEE 3143 Control System Design
The aim of this course is to present basic concepts in industrial control networks to students. It will highlight the basic system of interconnected equipment used to monitor and control the physical equipment in industrial environment. Fundamental concepts in conventional and industrial networks are initially described. Industrial control network components such as PLC, DCS and SCADA are also studied. The hierarchical and architecture of every level in industrial

control networks are also discussed. The types of network protocols which are often used in industrial environment at every level are described.

SEEL 4213 - Software Engineering
Pre-requisite: SECP 1103 C Programming Techniques
This course introduces various issues of system and software engineering. Focus is on software development process, program design, collaborative development and testing, which are the fundamental aspects of software engineering. Special emphasis will be given to object-oriented analysis and design (OOAD) as well as the use of UML in the design activities.

SEEL 4223 - Digital Signal Processing 1
Pre-requisite: SEEE 2073 Signal and System
This course introduces concepts in digital signal processing. Continuous-time signals and systems will be reviewed. Consecutively, introduction to digital signal processing, basic idea, benefits and applications are presented. Discrete-time signals and systems are described based on signal definition, periodicity, stability, causality, convolution, difference equations, infinite impulse response (IIR), finite impulse response (FIR) and signal flow graphs. Spectrum representation of discrete-time signals will cover sampling theorem, the discrete-time Fourier transform (DTFT) and its properties, and Discrete Fourier Transform (DFT). Another domain presented is Z-transform which consists of topics on derivations, region of convergence, transformation properties, poles and zeros, and inverse z-transform. At the end of the course, analysis and design of digital filters covers filter basics, analog filter prototypes and design of IIR filter and FIR filter.

SEEM 1113 - Engineering Mechanics
This course introduces students with the basic principles of engineering mechanics with emphasis on the analysis and application to practical engineering problems. The fundamental knowledge in vectors and the concept of force, mass and weight are reviewed. The force system and equilibrium of particles are covered consecutively. Kinematics and kinetics of particles with their governing physical laws are also introduced and analysed such that the students will gain the ability to apply these basic principles to solve mechanic problems.

SEEM 1502 - Computer Aided Engineering Drawing
This course introduces the use of engineering drawing as an effective way for communicating an engineering concept. It provides a platform where the engineers can share and exchange engineering design information. The information is prepared using a Computer-Aided Design (CAD) system, SolidWorksto produce two- (2D) and three-dimensional (3D) drawings. Techniques such as patterns, shelling, planes, ribs, revolve and assembly will be learned in the course. Finally,a 3D functional prototype will be developed using 3D printer.

SEEM 3123 - Hydraulic and Pneumatic Systems
Pre-requisite : SEEM 1113 Engineering Mechanics
This course intended to introduce the working principle of hydraulic and pneumatic systems. The hydraulic and pneumatic basic components and their functions will be described. Students will be taught how to analyse and design simple hydraulic and pneumatic circuits. Students will also be exposed to the design of electrical control circuits for electro-hydraulic and electro-

pneumatic systems. Finally, the basics on how to design and implement simple hydraulic and pneumatic control systems using PLC will also be covered.

SEEM 3133 - Electric Motor and Drives
Pre-requisite : SEEE 2413 Basic Power and Electric Machines
Students will be introduced to general information on electric motor and the electric drives components with linear control method for mechatronic systems. The dynamics of some basic mechatronics system treated as the load to the system will be covered and then the drives principles of DC motor and AC motor will be covered such that it matches the requirement of the system. To show the relationship between the theoretical and practical aspects of the subject, the development of modeling, analysis and application of DC and AC electric drives systems will be carried out. Matlab simulation, model validation and transient analysis of electric drive systems will be utilized and discussed.

SEEM 3742 - Specialized 3rd Year Laboratory
The purpose of this course is to provide students with practical experience in the use of equipment, experimental data analysis, and to develop basic skill in laboratory report writing. The students will be exposed to the common electrical engineering equipment and measurement techniques. At least 10 experiments from participating third year laboratories such as Control, Microprocessor and Industrial Electronic. At the end of the course students should be able to develop skills in report writing, improve their communication skills and know how to work in a team.

SEEM 4123 - Industrial Engineering
This course introduces the students from the fundamental engineering problem to the concept of industrial engineering. In general, Industrial Engineering is concerned with the design, improvement, and installation of integrated systems of people, materials, information, equipment and energy. It draws upon specialized knowledge and skill in the mathematical and physical together with the principals and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems. This course also introduce students how Industrial Engineers manage the integrated production and service delivery systems that assure performance, reliability, maintainability, schedule adherence and cost control.

SEEM 4133 - Machine Vision Systems
This course introduces students the concepts of machine vision as well as the introduction to building a machine vision inspection. The students will also learn image's representation and properties where essential basics concepts widely used in image analysis will be introduced. The students then taught data structures because data and algorithm are the two basic related parts in any program. Next, several important image pre-processing techniques are also will be introduced to the students followed by image segmentation. The main objective of segmentation is to divide an image between object(s) of interest and background. After that, student will be introduced to shape representation and description. Basically, shape representation and description consists of methods to extract a numeric feature vector or a non-numeric syntactic description word which characterizes properties of a region of interest. The next topic of discussion is object recognition. This topic will discuss several methods used

in pattern recognition. The student also will learn image understanding, an internal image model that represents the machine vision's concept about the process image of the world. To conclude the course, one project on machine vision application will be discussed with the students. Application of some machine vision algorithms will be demonstrated using Matlab in the class. By completing this course the student will be able to understand machine vision problems and apply the learned methods to solve machine visions problems.

SEEM 4143 - Robotics
Pre-requisite :SSCE 1993 Differential Equations
This course introduces students the basic principles underlying the design, analysis and synthesis of robotic systems. Students are introduced to various classifications and types of industrial robots, methods of deriving and analyzing robot kinematics, inverse kinematics, and dynamic model, as well as on the design of robot trajectory planning. Students are also introduced to the various robot sensors and vision systems. By adapting the knowledge obtained, students will be able to derive and analyze accurately the forward kinematics, the inverse kinematics, and the dynamics for various industrial robots, as well as the students will be able to design correctly the robot's trajectory.

SEEM 4153 - Robot Technology for Automation
Pre-requisite : SEEM 4143 Robotics
This course introduces students to the main aspects of the key technologies in the design and installation of robotic systems, automated work cells, computer integrated manufacturing systems, work cell support systems, robot and system integration, as well as safety design in robot applications. The students will learn machine interference and cycle time analysis when designing and analyzing the performance of the robot work cell. In addition to that, the students will be exposed to the simulation tool in designing and analyzing the robot work cell by using RobotStudio simulation software.

SEEM 4163 - Autonomous Robot
Pre-requisite : SEEM 4143 Robotics
As technology advances, it has been envisioned that in the very near future, robotic systems will become part and parcel of our everyday lives. Even at the current stage of development, semi-autonomous or fully automated robots are already indispensable in a staggering number of applications. To bring forth a generation of truly autonomous and intelligent robotic systems that will meld effortlessly into the human society involves research and development on several levels, from robot perception, to control, to abstract reasoning. This course tries for the first time to provide a comprehensive treatment of autonomous mobile systems, ranging from fundamental technical issues to practical system integration and applications. The students will be presented with a coherent picture of autonomous mobile systems at the systems level, and will also gain a better understanding of the technological and theoretical aspects involved within each module that composes the overall system. The chapters emphasize the different aspects of autonomous mobile systems, starting from sensors and control, and gradually moving up the cognitive ladder to planning and decision making, finally ending with the integration of the four modules in application case studies of autonomous systems.

SEEM 4173 - Artificial Intelligence

Artificial intelligence (AI) involves the development of algorithms derived from human and animal intelligence that have capabilities such as learning, reasoning, generalization, adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many domestic and industrial products and provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) and Particle Swarm Optimization (PSO), and how they are used as a stand-alone approach or in any combination of the methods in solving engineering and non-engineering problems.

SEEM 4223 - Embedded Systems

Pre-requisite : SEEE 3223 Microprocessor

This course introduces the principles and applications of embedded system. The topics emphasized are the microcontroller system architecture, software programming using C and the system design. The content covers internal peripherals such as general input and output, analogue to digital converter, serial communication interface, timer/counter and interrupt. The students will learn the technique to interface the microcontroller system with other devices in the embedded system for real world application. Students will also being introduce to ARM based embedded system and application.

SEEM 4333 - Mechatronics System Design

This course introduce the pertinent aspects of mechatronics including system modelling, simulation, sensors, actuation, real-time computer interfacing and control, needed to develop a good understanding of the basic principles used in mechatronic system design. This course tries to balance between theoretical and practical aspects, and real implementation is emphasized. Case-studies, based on problem-solving approach through demonstrations and lab exercises, are used throughout the course. From the material covered, the students will be able to analyse and select the appropriate sensors, actuators and interface, and design the PID control and its digital implementation correctly.

SEEM 4723 - Capstone Project

The course provides students with the opportunity to integrate technical knowledge and generic skills attained in the earlier years. This is to be achieved within the context of an engineering project conducted in a small team (typically three or four students) under the supervision of an academic staff and with optional of industry partner as advisor. Topics supplementing this course that include project management tools and practices, organizational structures, engineering standards as well as the social and environmental responsibility of professional engineers are covered in the Professional Ethics and/or Engineering Management courses offered prior to or concurrent with the course.

SEEM 4812 - Final Year Project Part I

The aim of the Final Year Project (FYP) is to give students opportunity to apply the knowledge that they have gained while studying in SKE to solve practical engineering problems in the area of Mechatronic Engineering. By doing so, it is hoped that the students will gain knowledge and experience in solving problems systematically thus when they graduate, they

will be ready to work as reliable and productive engineers. The FYP is spread over two semesters (one year), and this is the first part of the final year project. Student will be assigned a supervisor and project's topic at the beginning of the semester. Students are expected to do their work independently and their progress will be monitored closely by their supervisor.

SEEM 4824 - Final Year Project Part II
Pre-requisite : SEEM 4812 Final Year Project Part 1
The aim of the Final Year Project 2 (FYP2) is to provide students the opportunity to explore and implement creative and innovative knowledge to solve practical science, mathematical and engineering societal problems. Students are exposed to project management planning and execution. With these skills, it is hoped that the students will gain knowledge and experience in planning, designing and solving problems systematically thus when they graduate, they will be ready to work as reliable and productive engineers.

SEEM 4926 - Practical Training
Students will undergo a practical training lasting for a minimum of 10 weeks at an approved private, government or semi-government agency. The school will release the list of participating agencies. Placement at the respective agency will be initiated by the applications from the students. Approval of the application is at the discretion of the school. Undergraduates are expected to acquire hands on experience not only in the engineering aspects of work, but also to other related matters such as administration, accounting, management, safety, etc. during the industrial training period.

SEET 4633 - Coding of Multimedia Signals
Pre-requisite: SEET 3583 Digital Communication System
This course is an introduction to the coding and processing of digital multimedia signals. It covers current techniques for coding of multimedia signals such as audio, images, and video. Current video compression standards and formats will be discussed and introduced in this course. It focuses on the challenges of mobile video communication and provides methods in solving the issues.

SEEM 5753 - Advanced Instrumentation and Measurement
This course is an introduction to the advanced instrumentation and measurement. Key components studied in details are a review of powerful measurement techniques and basic principles and typical problems of sensor elements, detailed up-to-date reviews of the features of temperature sensors, displacement sensors, flow sensors, level sensors, position sensors, motion sensors and biometrics. This course also provides a detailed knowledge on error and determination of uncertainties in measurement. Besides that, this course introduces the multi sensor, Fusion application, wireless sensor network and Internet of Things. Finally, the basic concepts of safety instrumented system, standards and risk analysis techniques will be discussed.

SEEM 5713 - Artificial Intelligence and Applications
Artificial intelligence (AI) involves the development of algorithms derived from human & animal intelligence that have capabilities such as learning, reasoning, generalization, adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many

domestic & industrial products & provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) & Particle Swarm Optimization (PSO), & how they are used in solving engineering & non-engineering problems.

SEEM 5703 - Control Systems Engineering

This course introduces the students to the fundamental concepts of control systems engineering. Students will be exposed with techniques of modelling of physical systems involving linear and nonlinear systems including mechanical, electrical and mechatronic systems. Both the frequency domain and time domain (state-space) are covered. Several criteria for performance and stability analyses of control systems will be taught. Modelling and analysis of control system in discrete time for digital control will also be introduced. Student will also be exposed with MATLAB for design, development and analysis of simulation models. Finally, a feedback control system with controller to achieve control system objectives are described. Several case studies of the applications of controllers will be used to enhance the student understanding.

SCHOOL OF MECHANICAL ENGINEERING

MANAGEMENT TEAM

Position	Name
Chair	Assoc. Prof. Ir. Ts. Dr. Zaini Ahmad azaini@utm.my 07-5534567
Associate Chair (Academic and Student Development)	Professor Dr. Izman Sudin izman@utm.my 07-5557051
Associate Chair (Research and Academic Staff)	Assoc. Prof. Ir. Ts. Dr. Zaini Ahmad azaini@utm.my 07-5557048
Associate Chair (Quality and Strategy)	Assoc. Prof. Ts. Dr. Haslinda Mohamed Kamar haslinda@utm.my
Associate Chair (Continuous Education and TNE)	Dr. Engku Mohammad Nazim Engku Abu Bakar nazim@utm.my
Associate Chair (Facility)	Assoc. Prof. Dr. Mohamed Ruslan Abdullah ruslanabdullah@utm.my
Director (Applied Mechanics & Design)	Prof. Dr. Mohd Yazid Yahya yazidyahya@utm.my
Director (Aeronautics, Automotive & Ocean Engineering)	Prof. Ir. Ts. Dr. Pakharuddin Mohd Samin pakhar@utm.my 07-5557043

Director (Materials, Manufacturing & Industrial Engineering)	Assoc. Prof. Dr. Muhamad Azizi Mat Yajid azizi@utm.my 07-5557038
Director (Thermal Fluids)	Dr. Aminuddin Saat aminuddin@utm.my 07-5557036

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Demonstrate academic and technological excellence professionally and globally, particularly in areas related to mechanical engineering practices and contribute innovatively to the nation's wealth creation.
PEO2	Career advancement by achieving higher levels of responsibility, leadership and acquiring professional and advanced academic qualifications.
PEO3	Recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of the work and society.
PEO4	Adapt and communicate effectively and be successful working with multidisciplinary teams.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex mechanical and materials / Industrials / Manufacturing / Aeronautics / Automotive engineering problems. Keywords: **Engineering Knowledge**
PLO2	Identify, formulate and analyse complex mechanical and materials / Industrials / Manufacturing / Aeronautics / Automotive engineering problems. Keywords: **Problem Analysis**
PLO3	Design solutions for complex mechanical and materials / Industrials / Manufacturing / Aeronautics / Automotive engineering problems that fulfil health, safety, societal, cultural and environmental needs. Keywords: **Design/Development of Solutions**
PLO4	Investigate complex mechanical and materials / Industrials / Manufacturing / Aeronautics / Automotive engineering problems using research-based knowledge and methods to produce conclusive results. Keywords: **Investigation**
PLO5	Use modern engineering and information technology (IT) tools in complex mechanical and materials / Industrials / Manufacturing / Aeronautics / Automotive engineering activities, with an understanding of the limitations. Keywords: **Modern Tools Usage**
PLO6	Apply professional engineering practice and solutions to complex mechanical and materials / Industrials / Manufacturing / Aeronautics / Automotive

	engineering problems related to societal, health, safety, legal and cultural issues with full responsibility and integrity. Keywords: **The Engineer and Society**
PLO7	Evaluate the sustainability and impact of professional engineering work in the solutions of complex mechanical and materials / Industrials / Manufacturing / Aeronautics / Automotive engineering problems in societal and environmental contexts. Keywords: **Environment and Sustainability**
PLO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. Keywords: **Ethics**
PLO9	Communicate effectively on complex mechanical and materials / Industrials / Manufacturing / Aeronautics / Automotive engineering activities both orally and in writing. Keywords: **Communication**
PLO10	Work productively as an individual, and as a member or leader in a team that may involve multi-disciplinary settings. Keywords: **Team Working**
PLO11	Undertake lifelong learning and manage information including conducting literature study. Keywords: **Lifelong Learning**
PLO12	Demonstrate and apply knowledge on finance and management principles and acquire entrepreneurship skill. Keywords: **Project Management, Finance & Entrepreneurship**

BACHELOR OF MECHANICAL ENGINEERING (MATERIALS) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Mechanical Engineering (Materials) with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualification and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on course works and final examinations given throughout the semester.

General Information

1.	**Awarding Institution**		Universiti Teknologi Malaysia
2.	**Teaching Institution**		Universiti Teknologi Malaysia
3.	**Programme Name**		Bachelor of Mechanical Engineering (Materials) with Honours
4.	**Final Award**		Bachelor of Mechanical Engineering (Materials) with Honours
5.	**Programme Code**		SEMBH
6.	**Professional or Statutory Body of Accreditation**		Engineering Accreditation Council (EAC)
7.	**Language(s) of Instruction**		Bahasa Melayu and English
8.	**Mode of Study (Conventional, distance learning, etc.)**		Conventional
9.	**Mode of Operation (Franchise, self-govern, etc.)**		Self-govern
10.	**Study Scheme (Full Time / Part Time)**		Full Time
11.	**Study Duration**		Minimum : 4 years Maximum : 6 years
Type of Semester		No of Semesters	No of Weeks/Semester
Normal		8	14
Short		1	8
12.	**Entry Requirements**		Matriculation / STPM / Diploma or equivalent

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (a) General (b) Language (c) Entrepreneurship (d) Co-Curriculum	 10 8 2 3	16.4%
ii.	Programme Core	96	68.6%
iii.	Programme Electives	21	15.0%
	Total	**140**	**100%**
Classification of courses for engineering programme			
A	Engineering Courses (a) Lecture/Project/ Laboratory (b) Workshop/Field/Design Studio (c) Industrial Training (d) Final Year Project	 94 0 5 6	75%
	Total Credit Hours for Part A	**105**	
B	Non-Engineering (a) Applied Science/Mathematic/Computer (b) Management/Law/Humanities/Ethics/Economy (c) Language (d) Co-Curriculum	 12 12 8 3	25%
	Total Credit Hours for Part B	**35**	
Total credit hours for Part A and B		**140**	**100%**
Total Credit Hours to Graduate		**140 credit hours**	

AWARD REQUIREMENTS

To graduate, students must:

- Attain a total of not less than 140 credit hours with a minimum CGPA of 2.00.
- Has passed all specified courses.
- Has applied for graduation and has been approved by the University.
- Has completed all five (5) Professional Skills Certification (PSC) courses in UTM
- Other condition as specified.

AREAS OF STUDY

For the first two years the students will be exposed to the basic mechanical engineering courses. Subsequently, they will be introduced to materials engineering related courses covering the following areas:

(a) Physical Metallurgy

This course provides the physical basis, linking the structure of materials with their properties. It describes the microstructure, transformation and properties of metallic materials using solid state physics and chemical thermodynamics. Understanding the link between materials structure and mechanical properties will be discussed through the theory of crystallography.

(b) Mechanical Properties of Materials

Understanding of the mechanical behaviour of engineering materials (metals, ceramics, polymers and composites) and the types of materials failures encountered during service are very important. Materials engineers would be able to select suitable engineering materials for a particular product design with the knowledge of this course.

(c) Materials Characterization

In understanding the materials behaviour, the main techniques used for analysing and characterizing engineering materials for their structure will be discussed. Materials characterization provides the understanding of the link between physical/ chemical properties, structural features and processing of materials and it is of important to successful product development and quality control.

(d) Corrosion and Corrosion Control

Corrosion is concerned with the degradation and failure over time of all engineering materials due to their exposure to various environments such as seawater, atmosphere and chemicals. Apart from the high cost of repairing, the corroded structures may also endanger people's safety and result in loss of life. This course will expose prospective materials engineers on the importance of understanding the principles and mechanisms of corrosion and methods to control corrosion.

(e) Materials Selection

Materials engineers are often required to undertake technical tasks such as predicting the expected service life of engineering components. They are also required to work with other engineers to design products or manufacturing processes. Materials selection covers all aspects related to the concepts and methods of selecting suitable material for a given mechanical design. The influence of elements such as cost, sustainability and environment on materials selection will also be discussed.

(f) Non-Destructive Test

This course aims to develop an understanding of the working principles associated with established and widely used techniques for non-destructive testing (NDT), specifically dye penetration, magnetic particle, eddy current, ultrasonic and radiography. Upon completion of this course, the students will be able to understand the working principle,

needs and the technique to conduct the testing. This course will elaborate on the theory of each method, the probes needed, the mechanism to detect either surface or subsurface defects, the properties of materials to be tested, the test methods involved and the advantages and disadvantages of each method.

(g) Surface Engineering

This course covers the aspects of surface engineering, to develop fundamental understanding and the role of materials to allow surface selection for mechanical contacts and their surrounding environmental conditions. The course will explore a range of surface treatments and advanced coatings that are designed to minimize wear,friction and surface oxidation / corrosion. Applications and economics of surface treatments/coatings will be addressed by means of industrial case studies. The lectures will draw on examples from applications within the marine, oil and gas, aerospace and biomedical sectors. Emphasis will be placed on gaining sustainability through correct surface engineering technology. The economics of surface selection will be discussed for various examples, e.g. subsea components, machine tool coatings and thermal barrier coatings for aerospace.

(h) Advanced and Functional Materials

This course introduces students to the recent developments on the various classes of advanced and functional materials used in applications such as aerospace, automotive, biomedical and electronic industries. It will emphasize on the important properties exhibited by metallic, polymeric, ceramics and composite materials that make them selected for high-end and advanced applications. The physical and mechanical properties of the various classes of advanced materials (super alloys, titanium and aluminium alloys, intermetallic, biomaterials, electronic and magnetic materials) will be detailed as well as the processing techniques associated with producing these materials. The course will also cover smart materials such as shape memory alloys, Solar cell materials, fuel cells, high density energy storage batteries, Green materials, Smart sensors and actuators. The students are enabled to describe structural setup and function of advanced and functional materials. They command modern synthesis techniques and are able to apply these techniques to the preparation of new compounds. The students can interpret and evaluate the results of various methods for structural analysis of functional materials and apply the knowledge to select suitable materials for a given engineering project.

(i) Materials Processing

In addition, to select a suitable engineering material for a given product design, the processing method by which the selected material will be fabricated is also of crucial importance. It is to ensure that the final product conforms to the design specifications. This course introduces the various processing and fabrication techniques of engineering materials (metal, ceramic, polymer and composite)

(j) Nanomaterials

This course introduces students to fundamental aspects of nanomaterials and nanotechnology. The importance of the nanoscale materials and their improved properties compare to conventional materials. The principles and relative merits of a range of techniques for the fabrication of nanostructures in one dimensional and two-dimensional materials including single atomic layer and multilayers are discussed. The analytical and imaging characterization techniques and the recent applications of nanomaterials in engineering such as electronics, energy devices and biomaterials will be briefly discussed.

(k) Modelling in Materials Engineering

This course introduces students to the basic concepts of computer modelling in materials science and engineering. The course covers basic principle in establishing numerical simulation for the evaluation of material properties and phenomena during material processing. It will emphasize on atomistic, mesoscopic and microscopic evaluation of material properties and behavior by computer simulations. In detail, molecular dynamic method will be given as an example of atomistic evaluation method, whereas discrete dislocation dynamics will be used for mesoscopic simulation method. For microscopic scale evaluation, phase-field method will be introduced as an example. At the end of the course students should be able to construct simple numerical modelling both in atomistic, mesoscopic and microscopic scale.

CAREER PROSPECTS

Graduates of this programme are essentially Mechanical Engineers but those with specialization in Materials Engineering easily find job opportunities in various sectors. Alternatively, they can also be known as Materials Engineers depending on their job placements in industries, they are in.

The career of a Materials Engineer calls for an individual with a good understanding of the basic knowledge in science and engineering of materials plus able to relate the characteristics, structure, properties, processing and performance of materials in accordance with their use and demand and in conformance with the development in technology. Because any new product starts with materials, Materials Engineers work on the leading edge in many industries. In fact, a Materials Engineer directly involved in the aspect of materials selection, quality control, component failure analysis and Research and Development (R & D) in new materials.

Every product to be produced from design to processing system will require materials which usually consist of metals, polymers, ceramics or composites. Hence, the role of a Materials Engineer will be crucial especially when it involves selection of suitable materials and processing. Career opportunities for graduates in this field are very wide including metal and non-metal manufacturing industry, quality control, research (R & D), consultancy and education.

Thus, the career in the field of Mechanical and Materials Engineering is wide open covering all sectors-public, statutory and private sector. This covers the automotive, manufacturing, processing, research and development, service and consultancy, petroleum and petrochemical industry, electronic and semi-conductor as well as the aerospace industry. In

moving towards an industrialised nation, the role of a Materials Engineer will be very important especially in producing advanced material.

MOBILITY PROGRAMME (OUTBOUND)

Universiti Teknologi Malaysia (UTM) is offering five (5) types of mobility programs which allow UTM Student to go abroad and join academic programs in universities, institutions or organizations in all over the world. The opportunities offered are as below:

1. **Study Abroad / Student Exchange**
   Study Abroad/Student Exchange programme is a programme which allow student to spend one or two semesters at universities abroad and take courses in regular semester with credit transfer opportunity.

2. **Research Internship Abroad**
   Research Internship is a program which allow student to join research study or internship under the supervision of an academic staff at universities or industries abroad from all over the world.

3. **Global Outreach Programme (GOP)**
   GOP is a 7 to 14 days academic based program to experience various cultures in other countries. It includes immersion elements such as research & academic activities, social responsibility and cross-cultural activities.

4. **International Invitation Programme**
   Students participate in program organised by international institutions/ organisations with the following themes:
   (i) Seminar, Conference or Paper Presentation
   (ii) Cultural Exhibition and Conference
   (iii) Student Development Activity

5. **Summer School Abroad**
   Summer School program is a program which is designed to provide educational opportunities in 4 to 8 weeks during summer holiday abroad. It is related to environment, local community, heritage and tradition.

Details and appropriate forms and procedures can be reached at **UTM International link: http://www.utm.my/international/outbound-mobility-programs/**

COURSE MENU

YEAR 1: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1203	Static*	3	
SEMM 1503	Engineering Drawing	3	
SEMM 1911	Experimental Methods	1	
SEMM 1921	Introduction to Mechanical Engineering	1	
SSCE 1693	Engineering Mathematics 1	3	
SEEU 1002	Electrical Technology	2	
UHLB 1112	English Communication Skills	2	
UHIS 1022	Philosophy and Current Issues (for Local Student Only)	2	
UHIS 1022 OR UHMS1182	Philosophy and Current Issues (for International Students) OR Appreciation Ethics and Civilizations (for International Students)		
	Total	**17**	

YEAR 1: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1013	Programming for Engineers	3	
SEMM 1113	Mechanics of Solid I*	3	SEMM 1203
SEMM 1213	Dynamics*	3	SEMM 1203
SEMM 1513	Introduction to Design	3	SEMM 1503
UHMS 1182	Appreciation of Ethics and Civilizations (for Local Student Only)	2	
UHLM 1012	Malay Language for communication 2 (for International Student only)		
UHMT 1012	Graduate Success Attributes	2	
UKQF 2xx2	Co-curriculum and Service-Learning Elective	2	
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 2: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2123	Mechanics of Solids II*	3	SEMM 1113
SEMM 2313	Mechanics of Fluids I*	3	SEMM 1203, SEMM 1013
SEMM 2413	Thermodynamics*	3	
SEMM 2921	Laboratory I	1	SEMM 1911
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UHLB 2122	Academic Communication Skills	2	UHLB 1122
UHIT 2302	Thinking of Science and Technology	2	
	Total	17	

YEAR 2: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2223	Mechanics of Machines and Vibration*	3	SEMM 1213
SEMM 2323	Mechanics of Fluids II*	3	SEMM 2313
SEMM 2433	Applied Thermodynamic and Heat Transfer*	3	SEMM 2413
SEMM 2613	Materials Science	3	
SEMM 2713	Manufacturing Process	3	
SSCE 1793	Differential Equations	3	SSCE 1693
	Total	18	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 3: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMB 3613	Physical Metallurgy	3	SEMM 2613**
SEMM 3233	Control Engineering	3	SEMM 1213**, SSCE 1793**
SEMM 3523	Component Design	3	SEMM 2123**, SEMM 1513
SEMM 3813	Industrial Engineering	3	
SEMM 3931	Laboratory II	1	SEMM 2921
SEEU 2012	Electronic	2	SEEU 1002
UBSS 1032	Introduction to Entrepreneurship	2	
	Total	17	

YEAR 3: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMB 3623	Mechanical Properties of Materials	3	SEMM 2613**
SEMM 3023	Applied Numerical Methods	3	SEMM 1013, SSCE 1793
SEMM 3242	Instrumentation	2	SEEU2012**
SEMM 3823	Engineering Management, Safety and Economics	3	
SEMM 3941	Laboratory III	1	SEMM 3931
SSCE 2193	Engineering Statistics	3	
UHLB 3132	Professional Communication Skills	2	UHLB 1122, UHLB 2122
	Total	17	

YEAR 3: SHORT SEMESTER			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3915	Industrial Training	5	##SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
	Total	5	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Obtained minimum of 80 credits

YEAR 4: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMB 4613	Materials Characterization	3	SEMM 2613**
SEMB 4623	Corrosion and Corrosion Control	3	
SEMB 46x3	Elective I	3	
SEMB 5xx3	PRISMS Elective I		
SEMM 4533	System Design	3	SEMM 3523
SEMM 4912	Undergraduate Project I	2	SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
UXXX 2xx2	Generic Skills or Knowledge Expansion Cluster Elective	2	
	Total	16	

YEAR 4: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMB 4633	Materials Selection in Mechanical Design	3	
SEMB 46x3	Elective II	3	
SEMB 5xx3	PRISMS Elective II		
SEMM 4902	Engineering Professional Practice	2	Must be 3rd year
SEMM 4924	Undergraduate Project II	4	SEMM 4912
UHLX 1112	Foreign Language Elective	2	
UKQT 3001	Extra-Curricular Experiential Learning (ExCEL)	1	
	Total	15	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

* Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

Elective Courses

Apart from the core course, students must also take 6 credits of elective courses.

1.	SEMB 4643	Non-Destructive Testing
2.	SEMB 4653	Surface Engineering
3.	SEMB 4663	Advanced and Functional Materials
4.	SEMB 4673	Materials Processing
5.	SEMB 4683	Nanomaterials
6.	SEMB 4693	Modelling in Materials Engineering

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO	COURSE CODE	COURSE NAME	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (/) IF PASSED
MECHANICAL ENGINEERING COURSES					
1	SEMM 1013	Programming for Engineers	3	3	
2	SEMM 1113	Mechanics of Solids I	3	3	
3	SEMM 1203	Statics	3	3	
4	SEMM 1213	Dynamics	3	3	
5	SEMM 1503	Engineering Drawing	3	3	
6	SEMM 1513	Introduction to Design	3	3	
7	SEMM 1911	Experimental Methods	1	1	
8	SEMM 1921	Introduction to Mechanical Engineering	1	1	
9	SEMM 2123	Mechanics of Solids II	3	3	
10	SEMM 2223	Mechanics of Machines & Vibration	3	3	
11	SEMM 2313	Mechanics of Fluids I	3	3	
12	SEMM 2323	Mechanics of Fluids II	3	3	
13	SEMM 2413	Thermodynamics	3	3	
14	SEMM 2433	Applied Thermodynamics & Heat Transfer	3	3	
15	SEMM 2613	Materials Science	3	3	
16	SEMM 2713	Manufacturing Processes	3	3	
17	SEMM 2921	Laboratory I	1	1	
18	SEMM 3023	Applied Numerical Methods	3	3	
19	SEMM 3233	Control Engineering	3	3	
20	SEMM 3242	Instrumentation	2	2	
21	SEMM 3523	Component Design	3	3	
22	SEMM 3813	Industrial Engineering	3	3	
23	SEMM 3823	Engineering Management, Safety & Economics	3	3	
24	SEMM 3915	Industrial Training	5	HL	
25	SEMM 3931	Laboratory II	1	1	
26	SEMM 3941	Laboratory III	1	1	
27	SEMM 4533	System Design	3	3	
28	SEMM 4902	Engineering Professional Practice	2	2	
29	SEMM 4912	Undergraduate Project I	2	2	
30	SEMM 4924	Undergraduate Project II	4	4	
31	SEMB 3613	Physical Metallurgy	3	3	
32	SEMB 3623	Mechanical Properties of Materials	3	3	
33	SEMB 4613	Materials Characterization	3	3	

34	SEMB 4623	Corrosion & Corrosion Control	3	3	
35	SEMB 4633	Materials Selection in Mechanical Design	3	3	
36	SEMB 46x3	Elective I	3	3	
	SEMB 5xx3	PRISMS Elective I			
37	SEMB 46x3	Elective II	3	3	
	SEMB 5xx3	PRISMS Elective II			
TOTAL CREDIT FOR MECHANICAL ENGINEERING COURSES (A)			**101**	**96**	
ELECTRICAL COURSES (School of Electrical Engineering)					
1	SEEU 1002	Electrical Technology	2	2	
2	SEEU 2012	Electronics	2	2	
TOTAL CREDIT FOR ELECTRICAL COURSES (B)			**4**	**4**	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
TOTAL CREDIT FOR MATHEMATICS COURSES (C)			**12**	**12**	
UNIVERSITY GENERAL COURSES					
CLUSTER 1: APPRECIATION OF PHILOSOPHY, VALUE & HISTORY					
1	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students)			
2	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
CLUSTER 2: GENERIC SKILLS					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UHMT 2012	Leadership	2	2	
3.	UHMS 2022	Critical and Creative Thinking	2	2	
4.	UHMS 2032	The Human side of Knowledge Management	2	2	
5.	UHMS 2042	Development and Global Issues	2	2	
6.	UHMT 2042	Guidance & Counselling	2	2	
7.	UHMT 2062	Psychology of Adjustment	2	2	
8.	UBSS 2072	Fundamentals of Intellectual Property Law	2	2	

9.	UBSS 2082	Law for Entrepreneurs	2	2	
10.	UBSS 2092	Entrepreneurship and Enterprise Development	2	2	
11.	UBSS 2102	Social Entrepreneurship	2	2	
12.	UHMS 2112	Engineering Communication	2	2	
13.	UHMS 2122	Human Communication	2	2	
14.	UHMT 2132	Professional Ethics	2	2	
15.	UMJT 2142	Professional Ethics, Safety and Health (Ningen Ryoku)	2	2	
CLUSTER 3: KNOWLEDGE EXHANCEMENT					
1	UHIT 2302	Thinking of Science and Technology	2	2	
2	UHIT 1022	Science, Technology and Mankind	2	2	
3	UHII 2012	Al-Qur'an and Human Civilization	2	2	
4	UHIT 2032	Life Institutions and Sustainable Development	2	2	
5	UHIZ 2042	Future Studies	2	2	
6	UHIT 2052	Family Law	2	2	
7	UHIZ 2062	World Science	2	2	
8	UHIS 2072	Sustainable Economy	2	2	
9	UHIS 2082	Practice and Concept of Halal Management	2	2	
10	UHII 2092	Philosophy of Islamic Art	2	2	
11	UHII 2102	Islam and Health	2	2	
12	UHII 2132	Islamic Entrepreneurship	2	2	
13	UETS 2142	Sustainable Energy	2	2	
CLUSTER 4: CO-CURRICULUM & SERVICE LEARNING					
1	UKQX xxx2	Co-curriculum & Service-Learning Elective	2	2	
2	UKQT 3001	Extra-Curricular Experiential Learning	1	1	
CLUSTER 5: LANGUAGE SKILLS					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHLB 1032	Introductory Academic English	2	2	
5	UHLB 1042	Intermediate Academic English	2	2	
6	UHLA 1112	Arabic Language	2	2	
7	UHLJ 1112	Japanese Language 1	2	2	
8	UHLC 1112	Mandarin Language I	2	2	
9	UHLF 1112	French Language	2	2	
10	UHLN 1112	Persian Language	2	2	
11	UHLJ 1122	Japanese Language for Communication I	2	2	
12	UHLM 1112	Malay Language for Communication	2	2	

CLUSTER 6: ENTREPRENEURSHIP					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSES (D)			**23**	**23**	
TOTAL CREDIT TO GRADUATE (A + B + C + D)			**140**	**135**	
Note: # Choose one elective either from Cluster 2 (Generic Skills) or Cluster 3 (Knowledge Expansion) for UxxX 2xx2					
OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATION (PCS) • **Students are required to enrol and pass FIVE (5) PCS courses, in order to be eligible to graduate** • **Please refer to page FE 8 in UG Academic Handbook, for more information about PSC courses.**					
Compulsory PSC Courses (Enrol all 3 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
Elective PSC Courses (Choose 3 only)					
1	GSPX XXXX	Data Analytic for Organization			
2	GSPX XXXX	ISO 9001:2015 Quality Management System Requirement			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	How to Manage Your Personal Finance			

COURSE SYNOPSIS

CORE COURSES

SEMM 1013 - Programming for Engineers

This course formally introduces the concept of computers, algorithms, programming languages, pseudo-code, and design of programs for solution to computational engineering problems. The two programming languages introduced in this course are C and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting and model building.

SEMM 1113 - Mechanics of Solids I

The course provides students with the knowledge to determine the strength and stiffness of engineering structures being used. The structures that will be used in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SEMM 1203 - Statics

This course introduces students to the part of mechanic which is a pre-requisite for most engineering courses including SEMM 1213, SEMM 2313 and SEMM 1113. The course enables student to acquire the essential basic knowledge of resultant and equilibrium of forces. It will examine key elements in producing free body diagrams for particles and rigid bodies, as essential first step in solving applied mechanics problems. Exposure to the conceptof moment and equilibrium equations with reference of Newton's Law enhances the relevanceof friction, trusses, frames and machines applications. Students are also introduced to the concept of distributed forces, which include centroid and centre of gravity and the generated surface area and volume of revolution. Hence, students will be able to demonstrate and applythe knowledge in continuing subjects which requires the analytical skills developed in this subject.

SEMM 1213 - Dynamics

The course is an extension to SEMM 1203, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces energy and power to move a body.

SEMM 1503 - Engineering Drawing

This subject introduces student to the use of technical drawing in an effective way for communicating and integrating with engineering concepts. Such environment will provide a platform where the engineer can share and exchange information. This subject will also enlighten the student on the significant changes in the engineering and technical graphic due to the use of computer and CAD (Computer Aided Design) software. At the end of the course, student should be able to apply the skill and knowledge of engineering drawing to interpret design, using graphics method such as geometric drawing, orthographic projection, isometric, machine drawing, detailed drawing, and basic CAD software.

SEMM 1513 - Introduction to Design

This course is designed to introduce students to the concepts and methods of engineering design process in solving engineering design problems, creatively and effectively. The design process introduces problem background, concept generations and selections, development of selected concept and testing of selected concept by constructing and testing a prototype. This course serves as a preparation for students to proceed to higher level design classes.

SEMM 1911 - Experimental Methods

This course is conducted via lectures and experimental case study data. Students are exposed to the experimental method theory for the initial weeks and then followed by case study data. The lecture contents shall cover the fundamental of experimental method and the basic principles in measurements, instrumentation and analysis of results. It shall focus on the design of mechanical experiments, selection of sensors and transducers, estimation of errors and display of results. It shall also cover the analysis of results and how to prepare proper report writing. Student comprehension will be tested in two written tests. Based on the given experimental data, students are also expected to conduct statistical analysis of results and write the experimental outcome in a report.

SEMM 1921 - Introduction to Mechanical Engineering

This course comprises of two modules intended to introduce students to the field of mechanical engineering. The first module raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of generic skills to engineers. It also provides students with a clear overview of different fields within Mechanical Engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skill required for an engineer entrepreneur. This course introduces students to the field of mechanical engineering. It raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of both technical and generic skills to mechanical engineers. It also provides students with a clear overview of different fields within mechanical engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skills required for an engineering entrepreneur.

SEMM 2123 - Mechanics of Solids II

The course is an extension to SEMM 1113, which is the pre-requisite to this course. It aims to extend the student's knowledge and understanding of the behaviour of materials and structures under a variety of loading conditions. The course starts off with plane stress and plane strain transformation, following which several elastic failures criteria's are investigated. The course provides an opportunity to investigate thick cylinders, structural deformation behaviour by using the energy method, instability problems of struts and elasto-plastic bending of beams. Determinate and indeterminate problems will be examined. At the end of the course, students should be able to calculate and evaluate stress, strain and deformation of structures in torsion and bending. They should also be able to evaluate failure modes and estimate fracture life of structures and components. The aspect of designing safe components and structures shall also be emphasized to the students.

SEMM 2223 - Mechanics of Machines and Vibration

The course requires SEMM 1213 as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines which include belt and pulley systems, gears, flywheels, governors and gyroscopes. Students will also be exposed to the methods of balancing rotating masses and parts of a combustion engine. The concept of vibration with respect to one-degree-freedom is also studied. At the end of the course, the students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

SEMM 2313 - Mechanics of Fluids I

The principle aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behaviour and flow. It will emphasize on the concept of pressure, hydrostatic pressure equation and its application in the measurement of pressure, static force due to immersed surfaces, floatation and buoyancy analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduced especially to solve flow measurement, mass or volumetric flow rate, momentum in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate an ability to analyse whether statically, dynamically or kinematically problems related directly to fluids.

SEMM 2323 - Mechanics of Fluids II

This course is designed to enhance the basic knowledge that has been developed in the first stage of Fluid Mechanics and expose the students in analysing hydrodynamically the flow field. It will emphasize on the analysis and the importance of ideal, boundary layer, and compressible flow in a practical engineering application. The course will also provide the analysis of flow through fluid machines such as pump and turbine. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to flow of fluids.

SEMM 2413 - Thermodynamics

Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle expressed in the First Law of Thermodynamics will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

SEMM 2433 - Applied Thermodynamics & Heat Transfer

This course aims to develop a fundamental understanding of the processes by which heat and energy are inter-related and converted and by which heat is transferred. The course will review major principles of energy conversion and the modes of heat transfer. The basic laws of thermodynamics and the governing equations for heat transfer and thermodynamics will be introduced and subsequently used to solve practical engineering problems involving thermodynamics and heat transfer. The course will also cover fundamental principles of power generation systems.

SEMM 2613 - Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers and composites and their fundamental structures. The course will also provide basic diffusion mechanisms, metal solidification phase diagrams and heat treatment processes. At the end of the course, students should be able to apply the knowledge of atomic bonding and crystal structures to predict the physical and mechanical behaviour of materials and use the principlesof phase diagrams and heat treatments to the design of materials and their properties.

SEMM 2713 - Manufacturing Processes

This course discusses the fundamental aspect of various traditional and non-traditional manufacturing processes for metal and non-metal components. It starts from the overall introduction on manufacturing aspects followed by polymer shaping processes, casting processes, joining processes, metal forming processes and machining processes including CNC and CAM. At the end of this course, the students should be able to select suitable manufacturing processes to produce a part/product. The knowledge gained from this course also allows students to make right decision in designing products based on process requirements.

SEMM 2921 - Laboratory I

This course is introduced in the second year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It consists of six laboratories; Strengths of Materials Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluid Laboratory. Students will be grouped into 5 to 6 people for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each

experiment and will be evaluated based on this report.

SEMM 3023 - Applied Numerical Methods

This course formally introduces the steps involved in engineering analysis (mathematical modelling, solving the governing equation, and interpretation of the results). Examples of case studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and partial differential equation are introduced.

SEMM 3233 - Control Engineering

The course shall cover the essential and basic theory of control engineering. It shall cover the followings: open and closed-loop systems, manipulation of block diagram, signal flow graph and Mason's rule, concept of transfer function, time response analysis, classification of system, control action, stability analysis, Routh criteria, root locus method, frequency analysis, Nyquist and Bode plots, relative stability from Nyquist and Bode diagrams and design of control system. MATLAB and Simulink software package shall be taught and used as a tool in solving control engineering problems where appropriate.

SEMM 3242 - Instrumentation

The course shall cover the essential and basic theory of instrumentation for undergraduate. It shall cover the following: fundamentals and components of instrumentation system, characteristics of instrumentation system, signal conditioning and application of sensors in measurements.

SEMM 3523 - Components Design

This course is designed to expose students in analysing machine design element failure theories. This includes failure due to static and fatigue loads. It involves fatigue strength and endurance level, modified stress Goodman diagram and fatigue design under tensile and combined stresses. The content will encompass the design and selection of bolts, welding, spring, ball and roller bearing, gears and belts. At the end of the course, students should have the capabilities to identify, analyse and design the machine elements in the perspective of static and fatigue failure aspect.

SEMM 3813 - Industrial Engineering

This course introduces students to various theories, principles and the importance in the area of industrial engineering and project management. It covers issues related to productivity, quality, work study, ergonomics, facilities planning and project scheduling. The contents give some brief exposure on the concept and application of overall discipline for an industrial engineer. Some calculations or measurements are introduced as an approach before deciding the best alternative. Students should be able to describe fundamental aspects of project management and integrate knowledge in engineering and project management. In project management, students are exposed to several steps in developing project plan, managing risks, scheduling resources reducing project duration, and progress and performance measurement. At the end of the course, students should be able to apply various concept and tools in selecting the best alternative in terms of man, machine, materials, method and

management and planning and monitoring engineering projects.

SEMM 3823 - Engineering Management, Safety and Economics
This course aims to prepare students with basic management knowledge, safety and engineering economy. The management part will examine key issues in management and organization, past management and today, strategic management, organizational structure and design, human resource management, motivating employees and leadership. Major topics covered under safety are OSHA 1994, Factories and Machinery Act 1967, hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. In engineering economy, students are exposed to engineering economic principles and methods of engineering economic analysis. At the end of the course, students should be able to describe fundamental aspects of management; integrate knowledge in engineering and management in making business decisions; apply the principles of hazard identification, risk assessment/control; plan, design and implement an effective safety program; and also perform engineering economic analysis to solve problems and evaluate engineering investment/projects.

SEMM 3915 - Industrial Training
Industrial training exposes students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning that requires the students to learn the process and able to apply their knowledge acquired in class in actual industrial setting. The knowledge acquired during practical training may be used later in final year classes as well as to equip them with sufficient knowledge for job interviews.

SEMM 3931 - Laboratory II
This course is introduced in the third year of Mechanical Engineering programme involving two hours per week and experimental based courses. It consists of six laboratories; Strength of Materials Laboratory, Thermodynamics Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluids Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3941 - Laboratory III
This course is introduced in the third year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It is divided into two parts; experimental work at System & Control and Vibration Laboratories and a problem- based-learning (PBL) laboratory (module) depending on the topics/labs facilitated by a lecturer. Students have to produce a short report for the experimental work similar to those in Laboratory I and II. The second part, i.e., the lab module is based on the PBL concept. Students have to plan and design their own experimental work right from the very beginning until the end of the module based on the topics given by the lecturer. Students will be grouped into 5 to 6 for each module. In general, every group have to conduct two experimental works and two modules. At the end of the session, students have to submit two short reports and

two formal reports.

SEMM 4533 - System Design
This course is designed for students to gain detailed topical exposure to design methodologies and principles specific to the practice of mechanical design. Emphasis is on developing efficient and effective design techniques as well as project-oriented skills from both technical and non-technical considerations. At the end of this course, students should be able to identify and apply appropriate methodologies in performing design tasks, recognize the fundamental principles of mechanical designs and practices, formulate and apply general problem-solving strategies in the analysis of situations and potential problems and apply relevant industry standards in design. Student should also be able to communicate ideas and solutions in verbal and written forms by means of oral presentation and technical report.

SEMM 4902 - Engineering Professional Practice
This course introduces students to engineering ethics and an engineer's responsibilities towards safety, health and welfare of the public. It emphasizes on the engineer as a professional man, engineers & society, code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practice. The course will also introduce students to organize, in a group, community service activities in a planned and structured manner. At the end of the course, students should be able to demonstrate and apply engineering professional ethics in their career as an engineer.

SEMM 4912 - Undergraduate Project I
This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given a topic on a project, students have to identify a problem, gather relevant information to the problem and propose solutions to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

SEMM 4924 - Undergraduate Project II
This course is the continuation of Undergraduate Project (UGP) I. It enhances the students' knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and the ability to plan and manage their work effectively. This course will also develop the students' capability to present, discuss and analyse results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

SEMB 3613 - Physical Metallurgy
The course introduces the student to the basics of materials crystal structures and stereographic projection. It also provides students with knowledge of atom diffusion in solids, phase diagrams and phase transformation. The course will provide detailed knowledge on steels using the Fe-C phase diagram and various heat treatments and the effect on mechanical properties. At the end of the course students should be able to apply knowledge

acquired on phase diagrams and atomic diffusion to read, construct and predict the materials structure and mechanical properties and design suitable heat treatments that would give the optimum performance through the use of the interrelationship between microstructure-mechanical properties and processes.

SEMB 3623 - Mechanical Properties of Materials

This course introduces students to the fundamentals of dislocation theory and the role of these dislocations in predicting the metal's ability to deform plastically. It will focus on the mechanical behavior of all classes of materials (metals, polymers, ceramics and composites) under different stressing conditions such as fatigue, creep, and fracture. The course will also provide students with the principles of fracture mechanics and its application. The students also will be able to simulate and predict the mechanical behavior of materials using modern tools. At the end of the course the student should be able to link between the behaviour of materials and their structures and design procedures to control failure of materials.

SEMB 4613 - Materials Characterisation

This course will give an overview and the basic principles of the widely used materials characterisation techniques, namely, microstructure analysis using optical and electron microscopy, structure determination by x-ray diffraction and electron diffraction, chemical analysis by X-ray application, surface analysis by spectroscopy techniques and thermal analysis methods.

SEMB 4623 - Corrosion and Corrosion Control

This course introduces students to the basic principles of electrochemical and aqueous corrosion and oxidation of metals. The course will provide the principles that lead to metal corrosion and oxidation based on thermodynamics and Pourbaix diagrams, mixed potential theory and theory and application of passivity. The course will also provide knowledge on the various forms of corrosion and methods to control namely, by design, materials selection, cathodic protection, coatings and the use of inhibitors. At the end of the course students should be able to apply the knowledge to determine whether corrosion will occur in any given environment and recognize the different types of corrosion as well as able to suggest a corrosion control system for protection against corrosive environment.

SEMB 4633 - Materials Selection in Mechanical Design

This course introduces students to the basic concepts of materials selection and provides systematic methodology for materials and process selection in engineering design. The course will emphasize on describing the relationship between component design and materials selection and how materials selection fits into the design process from concept to the final details. The interaction between the manufacturing process and material selection and the need to adopt concurrent engineering approach is described. The effect of environment and economic impact on materials and process selection is also introduced. The course provides students with case studies and project in which the methodology of materials and process selection utilizing computer and specialized software is used. By the end of the course students should be able to perform the necessary calculations, identify the design/functional requirements of materials properties and perform the selection of candidate materials.

ELECTIVE COURSES

SEMB 4643 - Non-Destructive Testing

This course aims to develop an understanding of the working principles associated with established and widely used techniques for non-destructive testing (NDT), specifically dye penetration, magnetic particle, eddy current, ultrasonic and radiography. Upon completion of this course, the students will be able to understand the working principle, needs and the technique to conduct the testing. This course will elaborate on the theory of each method, the probes needed, the mechanism to detect either surface or subsurface defects, the properties of materials to be tested, the test methods involved and the advantages and disadvantages of each method.

SEMB 4653 - Surface Engineering

This course covers the aspects of surface engineering, to develop fundamental understanding and the role of materials to allow surface selection for mechanical contacts and their surrounding environmental conditions. The course will explore a range of surface treatments and advanced coatings that are designed to minimize wear, friction and surface oxidation / corrosion. Applications and economics of surface treatments/coatings will be addressed by means of industrial case studies. The lectures will draw on examples from applications within the marine, oil and gas, aerospace and biomedical sectors. Emphasis will be placed on gaining sustainability through correct surface engineering technology. The economics of surface selection will be discussed for various examples, e.g. subsea components, machine tool coatings and thermal barrier coatings for aerospace.

SEMB 4663 - Advanced and Functional Materials

This course introduces students to the recent developments on the various classes of advanced and functional materials used in applications such as aerospace, automotive, biomedical and electronic industries. It will emphasize on the important properties exhibited by metallic, polymeric, ceramics and composite materials that make them selected for high-end and advanced applications. The physical and mechanical properties of the various classes of advanced materials (super alloys, titanium and aluminium alloys, intermetallic, biomaterials, electronic and magnetic materials) will be detailed as well as the processing techniques associated with producing these materials. The course will also cover smart materials such as shape memory alloys, Solar cell materials, fuel cells, high density energy storage batteries, Green materials, Smart sensors and actuators. The students are enabled to describe structural setup and function of advanced and functional materials. They command modern synthesis techniques and are able to apply these techniques to the preparation of new compounds. The students can interpret and evaluate the results of various methods for structural analysis of functional materials and apply the knowledge to select suitable materials for a given engineering project.

SEMB 4673 - Materials Processing

This course introduces students to the manufacturing methods of engineering materials into the desired shapes. It starts with the basic concepts of manufacturing and processing and their applications to metals as it introduces students to solidification in casting, powder metallurgy, deformation processes. The course will examine the various processing methods

for metals, ceramics, polymers and composite materials, including joining and recycling processes for metals, polymer and ceramics. The course emphasis on the role played by materials and their properties in selecting the optimum manufacturing method. At the end of the course students should be able to demonstrate the ability to relate structure of materials to properties and processing method.

SEMB 4683 - Nanomaterials

This course introduces students to fundamental aspects of nanomaterials and nanotechnology. The importance of the nanoscale materials and their improved properties compare to conventional materials. The principles and relative merits of a range of techniques for the fabrication of nanostructures in one dimensional and two-dimensional materials including single atomic layer and multilayers are discussed. The analytical and imaging characterization techniques and the recent applications of nanomaterials in engineering such as electronics, energy devices and biomaterials will be briefly discussed.

SEMB 4693 - Modelling in Materials Engineering

This course introduces students to the basic concepts of computer modelling in materials science and engineering. The course covers basic principle in establishing numerical simulation for the evaluation of material properties and phenomena during material processing. It will emphasize on atomistic, mesoscopic and microscopic evaluation of material properties and behaviour by computer simulations. In detail, molecular dynamic method will be given as an example of atomistic evaluation method, whereas discrete dislocation dynamics will be used for mesoscopic simulation method. For microscopic scale evaluation, phase-field method will be introduced as an example. At the end of the course students should be able to construct simple numerical modelling both in atomistic, mesoscopic and microscopic scale.

BACHELOR OF MECHANICAL ENGINEERING (INDUSTRIALS) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Mechanical Engineering (Industrials) with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualification and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on course works and final examinations given throughout the semester.

General Information

1.	**Awarding Institution**		Universiti Teknologi Malaysia
2.	**Teaching Institution**		Universiti Teknologi Malaysia
3.	**Programme Name**		Bachelor of Mechanical Engineering (Industrials) with Honours
4.	**Final Award**		Bachelor of Mechanical Engineering (Industrials) with Honours
5.	**Programme Code**		SEMIH
6.	**Professional or Statutory Body of Accreditation**		Engineering Accreditation Council (EAC)
7.	**Language(s) of Instruction**		Bahasa Melayu and English
8.	**Mode of Study (Conventional, distance learning, etc.)**		Conventional
9.	**Mode of Operation (Franchise, self-govern, etc.)**		Self-govern
10.	**Study Scheme (Full Time / Part Time)**		Full Time
11.	**Study Duration**		Minimum : 4 years Maximum : 6 years
Type of Semester		No of Semesters	No of Weeks/Semester
Normal		8	14
Short		1	8
12.	**Entry Requirements**		Matriculation / STPM / Diploma or equivalent

Course Classification

No	Classification	Credit Hours	Percentage
i.	University Courses (e) General (f) Language (g) Entrepreneurship (h) Co-Curriculum	 10 8 2 3	16.4%
ii.	Programme Core	90	64.3%
iii.	Programme Electives	27	19.3%
	Total	**140**	**100%**
Classification of courses for engineering programme			
A	Engineering Courses (e) Lecture/Project/ Laboratory (f) Workshop/Field/Design Studio (g) Industrial Training (h) Final Year Project	 94 0 5 6	75%
	Total Credit Hours for Part A	**105**	
B	Non-Engineering (e) Applied Science/Mathematic/Computer (f) Management/Law/Humanities/Ethics/Economy (g) Language (h) Co-Curriculum	 12 12 8 3	25%
	Total Credit Hours for Part B	**35**	
Total credit hours for Part A and B		**140**	**100%**
Total Credit Hours to Graduate		**140 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 140 credit hours with a minimum CGPA of 2.00.
- Has passed all specified courses.
- Has applied for graduation and has been approved by the University.
- Has completed all five (5) Professional Skills Certification (PSC) courses in UTM
- Other condition as specified.

MOBILITY PROGRAMME (OUTBOUND)

Universiti Teknologi Malaysia (UTM) is offering five (5) types of mobility programs which allow UTM Student to go abroad and join academic programs in universities, institutions or organizations in all over the world. The opportunities offered are as below:

1. Study Abroad / Student Exchange

Study Abroad/Student Exchange programme is a programme which allow student to spend one or two semesters at universities abroad and take courses in regular semester with credit transfer opportunity.

2. Research Internship Abroad

Research Internship is a program which allow student to join research study or internship under the supervision of an academic staff at universities or industries abroad from all over the world.

3. Global Outreach Programme (GOP)

GOP is a 7 to 14 days academic based program to experience various cultures in other countries. It includes immersion elements such as research & academic activities, social responsibility and cross-cultural activities.

4. International Invitation Programme

Students participate in program organised by international institutions/ organisations with the following themes:

(iv) Seminar, Conference or Paper Presentation
(v) Cultural Exhibition and Conference
(vi) Student Development Activity

5. Summer School Abroad

Summer School program is a program which is designed to provide educational opportunities in 4 to 8 weeks during summer holiday abroad. It is related to environment, local community, heritage and tradition.

Details and appropriate forms and procedures can be reached at **UTM International link: http://www.utm.my/international/outbound-mobility-programs/**

COURSE MENU

YEAR 1: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1013	Programming for Engineers	3	
SEMM 1203	Static*	3	
SEMM 1503	Engineering Drawing	3	
SEMM 1911	Experimental Methods	1	
SEMM 1921	Introduction to Mechanical Engineering	1	
SSCE 1693	Engineering Mathematics I	3	
UHLB 1112	English Communication Skills	2	
UHIS 1022	Philosophy and Current Issues (for Local Students Only)	2	
UHIS 1022 OR UHMS1182	Philosophy and Current Issues OR Appreciation Ethics and Civilizations (for International Students)		
	Total	**18**	

YEAR 1: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1113	Mechanics of Solids I*	3	SEMM 1203
SEMM 1213	Dynamics*	3	SEMM 1203
SEMM 1513	Introduction to Design	3	SEMM 1503
SEEU 1002	Electrical Technology	2	
SSCE 1793	Differential Equations	3	SSCE 1693
UHMT 1012	Graduate Success Attributes	2	
UHMS 1182	Appreciation of Ethics and Civilisations (for Local Students Only)	2	
UHLM 1012	Malay Language for Communication 2 (for International Students Only)		
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 2: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2123	Mechanics of Solids II*	3	SEMM 1113
SEMM 2223	Mechanics of Machines and Vibration*	3	SEMM 1213
SEMM 2313	Mechanics of Fluids I*	3	SEMM 1203, SEMM 1013*
SEMM 2413	Thermodynamics*	3	
UHLB 2122	Academic Communication Skills	2	UHLB 1112
UHIT 2302	Thinking of Science and Technology	2	
	Total	16	

YEAR 2: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2323	Mechanics of Fluids II*	3	SEMM 2313
SEMM 2433	Applied Thermodynamics and Heat Transfer*	3	SEMM 2413
SEMM 2613	Materials Science	3	
SEMM 2921	Laboratory I	1	SEMM 1911
SEEU 2012	Electronics	2	SEEU 1002
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
SSCE 2193	Engineering Statistics	3	
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 3: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2713	Manufacturing Processes	3	
SEMM 3233	Control Engineering	3	SEMM 1213**, SSCE 1793**
SEMM 3931	Laboratory II	1	SEMM 2921
SEMI 3813	Work Design and Productivity	3	
SEMI 3823	Quality System	3	
UBSS 1032	Introduction to Entrepreneurship	2	
UKQF 2xx2	Co-curriculum and Service-Learning Elective	2	
	Total	17	

YEAR 3: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3023	Applied Numerical Methods	3	SEMM 1013, SSCE 1793
SEMM 3242	Instrumentation	2	SEEU2012**
SEMM 3523	Component Design	3	SEMM 2123**, SEMM 1513
SEMM 3941	Laboratory III	1	SEMM 3931
SEMI 3833	Production Planning and Control	3	
SEMI 3843	Engineering Economy and Accounting	3	
UHLB 3132	Professional Communication Skills	2	UHLB 1112, UHLB 2122
	Total	17	

YEAR 3: SHORT SEMESTER			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3915	Industrial Training	5	##, SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
	Total	5	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Obtained minimum of 80 credits

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 4: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4533	System Design (capstone)	3	SEMM 3523
SEMM 4912	Undergraduate Project I	2	SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
SEMI 4813	Industrial System Simulation	3	
SEMI 4823	Operations Research	3	
SEMI 48x3	Industrial Engineering Elective	3	
SEMI 5xx3	PRISMS Elective		
UXXX 2xx2	Generic Skills or Knowledge Expansion Cluster Elective	2	
	Total	16	

YEAR 4: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4902	Engineering Professional Practice (Academic Service Learning)	2	Must be 3rd year
SEMM 4924	Undergraduate Project II	4	SEMM 4912
SEMI 4833	Safety and Engineering Management	3	
SEMI 4843	Facility Design	3	
UHLX 1112	Foreign Language Elective	2	
UKQT 3001	Extra-Curricular Experiential Learning (ExCEL)	1	
	Total	15	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Obtained minimum of 80 credits

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

* Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

Elective Courses

List of Industrial Engineering Elective Courses (Students may take ONE of the following courses)

1.	SEMI 4853	Quality Engineering
2.	SEMI 4863	Ergonomics and Occupational Safety
3.	SEMI 4873	Reliability and Maintenance
4.	SEMI 4883	Supply Chain Management and Sustainability

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO	COURSE CODE	COURSE NAME	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (/) IF PASSED
MECHANICAL ENGINEERING COURSES					
1	SEMM 1013	Programming for Engineers	3	3	
2	SEMM 1113	Mechanics of Solids I	3	3	
3	SEMM 1203	Statics	3	3	
4	SEMM 1213	Dynamics	3	3	
5	SEMM 1503	Engineering Drawing	3	3	
6	SEMM 1513	Introduction to Design	3	3	
7	SEMM 1911	Experimental Methods	1	1	
8	SEMM 1921	Introduction to Mechanical Engineering	1	1	
9	SEMM 2123	Mechanics of Solids II	3	3	
10	SEMM 2223	Mechanics of Machines & Vibration	3	3	
11	SEMM 2313	Mechanics of Fluids I	3	3	
12	SEMM 2323	Mechanics of Fluids II	3	3	
13	SEMM 2413	Thermodynamics	3	3	
14	SEMM 2433	Applied Thermodynamics & Heat Transfer	3	3	
15	SEMM 2613	Materials Science	3	3	
16	SEMM 2713	Manufacturing Processes	3	3	
17	SEMM 2921	Laboratory I	1	1	
18	SEMM 3023	Applied Numerical Methods	3	3	
19	SEMM 3233	Control Engineering	3	3	
20	SEMM 3242	Instrumentation	2	2	
21	SEMM 3523	Component Design	3	3	
22	SEMM 3915	Industrial Training	5	HL	
23	SEMM 3931	Laboratory II	1	1	
24	SEMM 3941	Laboratory III	1	1	
25	SEMM 4533	System Design	3	3	
26	SEMM 4902	Engineering Professional Practice	2	2	
27	SEMM 4912	Undergraduate Project I	2	2	
28	SEMM 4924	Undergraduate Project II	4	4	
29	SEMI 3813	Work Design & Productivity	3	3	
30	SEMI 3823	Quality System	3	3	
31	SEMI 3833	Production Planning & Control	3	3	
32	SEMI 3843	Engineering Economy &	3	3	

		Accounting			
33	SEMI 4813	Industrial System Simulation	3	3	
34	SEMI 4823	Operations Research	3	3	
35	SEMI 4833	Safety & Engineering Management	3	3	
36	SEMI 4843	Facility Design	3	3	
37	SEMI 48x3	Industrial Engineering Elective	3	3	
	SEMI 58x3	PRISMS Elective			
TOTAL CREDIT FOR MECHANICAL ENGINEERING COURSES (A)			**101**	**96**	
ELECTRICAL COURSES (School of Electrical Engineering)					
1	SEEU 1002	Electrical Technology	2	2	
2	SEEU 2012	Electronics	2	2	
TOTAL CREDIT FOR ELECTRICAL COURSES (B)			**4**	**4**	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
TOTAL CREDIT FOR MATHEMATICS COURSES (C			**12**	**12**	
UNIVERSITY GENERAL COURSES					
CLUSTER 1: APPRECIATION OF PHILOSOPHY, VALUE & HISTORY					
1	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students)			
2	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
CLUSTER 2: GENERIC SKILLS					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UHMT 2012	Leadership	2	2	
3.	UHMS 2022	Critical and Creative Thinking	2	2	
4.	UHMS 2032	The Human side of Knowledge Management	2	2	
5.	UHMS 2042	Development and Global Issues	2	2	
6.	UHMT 2042	Guidance & Counselling	2	2	
7.	UHMT 2062	Psychology of Adjustment	2	2	
8.	UBSS 2072	Fundamentals of Intellectual	2	2	

		Property Law			
9.	UBSS 2082	Law for Entrepreneurs	2	2	
10.	UBSS 2092	Entrepreneurship and Enterprise Development	2	2	
11.	UBSS 2102	Social Entrepreneurship	2	2	
12.	UHMS 2112	Engineering Communication	2	2	
13.	UHMS 2122	Human Communication	2	2	
14.	UHMT 2132	Professional Ethics	2	2	
15.	UMJT 2142	Professional Ethics, Safety and Health (Ningen Ryoku)	2	2	
CLUSTER 3: KNOWLEDGE EXHANCEMENT					
1.	UHIT 2302	Science and Technology Thinking	2	2	
2.	UHIT 1022	Science, Technology and Mankind	2	2	
3.	UHII 2012	Al-Qur'an and Human Civilization	2	2	
4.	UHIT 2032	Life Institutions and Sustainable Development	2	2	
5.	UHIZ 2042	Future Studies	2	2	
6.	UHIT 2052	Family Law	2	2	
7.	UHIZ 2062	World science	2	2	
8.	UHIS 2072	Sustainable Economy	2	2	
9.	UHIS 2082	Practice and Concept of Halal Management	2	2	
10.	UHII 2092	Philosophy of Islamic Art	2	2	
11.	UHII 2102	Islam and Health	2	2	
12.	UHII 2132	Islamic Entrepreneurship	2	2	
13.	UETS 2142	Sustainable Energy	2	2	
CLUSTER 4: CO-CURRICULUM & SERVICE LEARNING					
1	UKQX xxx2	Co-curriculum & Service-Learning Elective	2	2	
2	UKQE 3001	Extra-Curricular Experiential Learning	1	1	
CLUSTER 5: LANGUAGE SKILLS					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHLB 1032	Introductory Academic English	2	2	
5	UHLB 1042	Intermediate Academic English	2	2	
6	UHLA 1112	Arabic Language	2	2	
7	UHLJ 1112	Japanese Language 1	2	2	
8	UHLC 1112	Mandarin Language I	2	2	
9	UHLF 1112	French Language	2	2	

10	UHLN 1112	Persian Language	2	2	
11	UHLJ 1122	Japanese Language for Communication I	2	2	
12	UHLM 1112	Malay Language for Communication	2	2	
CLUSTER 6: ENTREPRENEURSHIP					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSES (D)			**23**	**23**	
TOTAL CREDIT TO GRADUATE (A + B + C + D)			**140**	**135**	
Note: # Choose one elective either from Cluster 2 (Generic Skills) or Cluster 3 (Knowledge Expansion) for UxxX 2xx2					
OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATION (PCS) • **Students are required to enrol and pass FIVE (5) PCS courses, in order to be eligible to graduate** • **Please refer to page FE 8 in UG Academic Handbook, for more information about PSC courses.**					
Compulsory PSC Courses (Enrol all 3 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
Elective PSC Courses (Choose 3 only)					
1	GSPX XXXX	Data Analytic for Organization			
2	GSPX XXXX	ISO 9001:2015 Quality Management System Requirement			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	How to Manage Your Personal Finance			

COURSE SYNOPSIS

CORE COURSE

SEMM 1013 - Programming for Engineers

This course formally introduces the concept of computers, algorithms, programming languages, pseudo-code, and design of programs for solution to computational engineering problems. The two programming languages introduced in this course are C and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting and model building.

SEMM 1113 - Mechanics of Solids I

The course provides students with the knowledge to determine the strength and stiffness of engineering structures being used. The structures that will be used in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SEMM 1203 - Statics

This course introduces students to the part of mechanic which is a pre-requisite for most engineering courses including SEMM 1213, SEMM 2313 and SEMM 1113. The course enables student to acquire the essential basic knowledge of resultant and equilibrium of forces. It will examine key elements in producing free body diagrams for particles and rigid bodies, as essential first step in solving applied mechanics problems. Exposure to the conceptof moment and equilibrium equations with reference of Newton's Law enhances the relevanceof friction, trusses, frames and machines applications. Students are also introduced to the concept of distributed forces, which include centroid and centre of gravity and the generated surface area and volume of revolution. Hence, students will be able to demonstrate and applythe knowledge in continuing subjects which requires the analytical skills developed in this subject.

SEMM 1213 - Dynamics

The course is an extension to SEMM 1203, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces energy and power to move a body.

SEMM 1503 - Engineering Drawing

This subject introduces student to the use of technical drawing in an effective way for communicating and integrating with engineering concepts. Such environment will provide a platform where the engineer can share and exchange information. This subject will also enlighten the student on the significant changes in the engineering and technical graphic due to the use of computer and CAD (Computer Aided Design) software. At the end of the course, student should be able to apply the skill and knowledge of engineering drawing to interpret design, using graphics method such as geometric drawing, orthographic projection, isometric, machine drawing, detailed drawing, and basic CAD software.

SEMM 1513 - Introduction to Design

This course is designed to introduce students to the concepts and methods of engineering design process in solving engineering design problems, creatively and effectively. The design process introduces problem background, concept generations and selections, development of selected concept and testing of selected concept by constructing and testing a prototype. This course serves as a preparation for students to proceed to higher level design classes.

SEMM 1911 - Experimental Methods

This course is conducted via lectures and experimental case study data. Students are exposed to the experimental method theory for the initial weeks and then followed by case study data. The lecture contents shall cover the fundamental of experimental method and the basic principles in measurements, instrumentation and analysis of results. It shall focus on the design of mechanical experiments, selection of sensors and transducers, estimation of errors and display of results. It shall also cover the analysis of results and how to prepare proper report writing. Student comprehension will be tested in two written tests. Based on the given experimental data, students are also expected to conduct statistical analysis of results and write the experimental outcome in a report.

SEMM 1921 - Introduction to Mechanical Engineering

This course comprises of two modules intended to introduce students to the field of mechanical engineering. The first module raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of generic skills to engineers. It also provides students with a clear overview of different fields within Mechanical Engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skill required for an engineer entrepreneur. This course introduces students to the field of mechanical engineering. It raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of both technical and generic skills to mechanical engineers. It also provides students with a clear overview of different fields within mechanical engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skills required for an engineering entrepreneur.

SEMM 2123 - Mechanics of Solids II

The course is an extension to SEMM 1113, which is the pre-requisite to this course. It aims to extend the student's knowledge and understanding of the behaviour of materials and structures under a variety of loading conditions. The course starts off with plane stress and plane strain transformation, following which several elastic failure criteria's are investigated. The course provides an opportunity to investigate thick cylinders, structural deformation behaviour by using the energy method, instability problems of struts and elasto-plastic bending of beams. Determinate and indeterminate problems will be examined. At the end of the course, students should be able to calculate and evaluate stress, strain and deformation of structures in torsion and bending. They should also be able to evaluate failure modes and estimate fracture life of structures and components. The aspect of designing safe components and structures shall also be emphasized to the students.

SEMM 2223 - Mechanics of Machines and Vibration

The course requires SEMM 1213 as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines which include belt and pulley systems, gears, flywheels, governors and gyroscopes. Students will also be exposed to the methods of balancing rotating masses and parts of a combustion engine. The concept of vibration with respect to one-degree-freedom is also studied. At the end of the course, the students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

SEMM 2313 - Mechanics of Fluids I

The principle aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behaviour and flow. It will emphasize on the concept of pressure, hydrostatic pressure equation and its application in the measurement of pressure, static force due to immersed surfaces, floatation and buoyancy analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduced especially to solve flow measurement, mass or volumetric flow rate, momentum in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate an ability to analyze whether statically, dynamically or kinematically problems related directly to fluids.

SEMM 2323 - Mechanics of Fluids II

This course is designed to enhance the basic knowledge that has been developed in the first stage of Fluid Mechanics and expose the students in analysing hydrodynamically the flow field. It will emphasize on the analysis and the importance of ideal, boundary layer, and compressible flow in a practical engineering application. The course will also provide the analysis of flow through fluid machines such as pump and turbine. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to flow of fluids.

SEMM 2413 - Thermodynamics

Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle expressed in the First Law of Thermodynamics will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

SEMM 2433 - Applied Thermodynamics & Heat Transfer

This course aims to develop a fundamental understanding of the processes by which heat and energy are inter-related and converted and by which heat is transferred. The course will review major principles of energy conversion and the modes of heat transfer. The basic laws of thermodynamics and the governing equations for heat transfer and thermodynamics will be introduced and subsequently used to solve practical engineering problems involving thermodynamics and heat transfer. The course will also cover fundamental principles of power generation systems.

SEMM 2613 - Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers and composites and their fundamental structures. The course will also provide basic diffusion mechanisms, metal solidification phase diagrams and heat treatment processes. At the end of the course, students should be able to apply the knowledge of atomic bonding and crystal structures to predict the physical and mechanical behaviour of materials and use the principlesof phase diagrams and heat treatments to the design of materials and their properties.

SEMM 2713 - Manufacturing Processes

This course discusses the fundamental aspect of various traditional and non-traditional manufacturing processes for metal and non-metal components. It starts from the overall introduction on manufacturing aspects followed by polymer shaping processes, casting processes, joining processes, metal forming processes and machining processes including CNC and CAM. At the end of this course, the students should be able to select suitable manufacturing processes to produce a part/product. The knowledge gained from this course also allows students to make right decision in designing products based on process requirements.

SEMM 2921 - Laboratory I

This course is introduced in the second year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It consists of six laboratories; Strengths of Materials Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluid Laboratory. Students will be grouped into 5 to 6 people for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each

experiment and will be evaluated based on this report.

SEMM 3233 - Control Engineering
The course shall cover the essential and basic theory of control engineering. It shall cover the followings: open and closed-loop systems, manipulation of block diagram, signal flow graph and Mason's rule, concept of transfer function, time response analysis, classification of system, control action, stability analysis, Routh criteria, root locus method, frequency analysis, Nyquist and Bode plots, relative stability from Nyquist and Bode diagrams and design of control system. MATLAB and Simulink software package shall be taught and used as a tool in solving control engineering problems where appropriate.

SEMM 3242 - Instrumentation
The course shall cover the essential and basic theory of instrumentation for undergraduate. It shall cover the following: fundamentals and components of instrumentation system, characteristics of instrumentation system, signal conditioning and application of sensors in measurements.

SEMM 3523 - Components Design
This course is designed to expose students in analysing machine design element failure theories. This includes failure due to static and fatigue loads. It involves fatigue strength and endurance level, modified stress Goodman diagram and fatigue design under tensile and combined stresses. The content will encompass the design and selection of bolts, welding, spring, ball and roller bearing, gears and belts. At the end of the course, students should have the capabilities to identify, analyse and design the machine elements in the perspective of static and fatigue failure aspect.

SEMM 3023 - Applied Numerical Methods
This course formally introduces the steps involved in engineering analysis (mathematical modelling, solving the governing equation, and interpretation of the results). Examples of case studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and partial differential equation are introduced.

SEMM 3915 - Industrial Training
Industrial training exposes students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning that requires the students to learn the process and able to apply their knowledge acquired in class in actual industrial setting. The knowledge acquired during practical training may be used later in final year classes as well as to equip them with sufficient knowledge for job interviews.

SEMM 3931 - Laboratory II
This course is introduced in the third year of Mechanical Engineering programme involving two hours per week and experimental based courses. It consists of six laboratories; Strength of Materials Laboratory, Thermodynamics Laboratory, Materials Science Laboratory,

Mechanics of Machines Laboratory, Electrical Laboratory and Fluids Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3941 - Laboratory III

This course is introduced in the third year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It is divided into two parts; experimental work at System & Control and Vibration Laboratories and a problem- based-learning (PBL) laboratory (module) depending on the topics/labs facilitated by a lecturer. Students have to produce a short report for the experimental work similar to those in Laboratory I and II. The second part, i.e., the lab module is based on the PBL concept. Student have to plan and design their own experimental work right from the very beginning until the end of the module based on the topics given by the lecturer. Students will be grouped into 5 to 6 for each module. In general, every group have to conduct two experimental works and two modules. At the end of the session, students have to submit two short reports and two formal reports.

SEMM 4533 - System Design

This course is designed for students to gain detailed topical exposure to design methodologies and principles specific to the practice of mechanical design. Emphasis is on developing efficient and effective design techniques as well as project-oriented skills from both technical and non-technical considerations. At the end of this course, students should be able to identify and apply appropriate methodologies in performing design tasks, recognize the fundamental principles of mechanical designs and practices, formulate and apply general problem-solving strategies in the analysis of situations and potential problems and apply relevant industry standards in design. Student should also be able to communicate ideas and solutions in verbal and written forms by means of oral presentation and technical report.

SEMM 4902 - Engineering Professional Practice

This course introduces students to engineering ethics and an engineer's responsibilities towards safety, health and welfare of the public. It emphasizes on the engineer as a professional man, engineers & society, code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practice. The course will also introduce students to organize, in a group, community service activities in a planned and structured manner. At the end of the course, students should be able to demonstrate and apply engineering professional ethics in their career as an engineer.

SEMM 4912 - Undergraduate Project I

This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given a topic on a project, students have to identify a problem, gather relevant information to the problem and propose solutions to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the

problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

SEMM 4924 - Undergraduate Project II
This course is the continuation of Undergraduate Project (UGP) I. It enhances the students' knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and the ability to plan and manage their work effectively. This course will also develop the students' capability to present, discuss and analyze results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

SEMI 3813 - Work Design and Productivity
This subject is designed to introduce students to techniques in designing work in manufacturing and service industries. It will emphasize on method study and work measurement. Other concepts and approach will also be introduced such as Productivity, Sustainability, Principles of Motion Economy, Design for Manufacture and Assembly (DFMA), Single Minute Exchange of Die (SMED) and Mistake Proofing (Poka Yoke). At the end of the course, students should be able to select the appropriate techniques, approaches and concepts in designing work that optimizes the use of resources such as man, machine, materials and time to improve productivity.

SEMI 3823 - Quality System
This course emphasizes on the importance of quality and productivity in industrial and operation systems. The principles of quality Improvement strategies and quality management systems such as Total Quality Management, Six Sigma, Lean Sigma, ISO 9000, ISO 14000 are highlighted. Statistical process control (SPC) techniques such as seven basic tools, variable and attribute control charts, process capability studies, acceptance sampling and reliability are covered. Students are required to work in groups to integrate the quality and statistical engineering tools in solving case studies problems.

SEMI 3833 - Production Planning and Control
This course is designed to expose students to the several theories and principles in Production Planning and Control (PPC) either in manufacturing or service sectors. It discusses issues on forecasting, capacity and aggregate planning, scheduling, inventory control and also computerized manufacturing system such as Manufacturing Requirement Planning (MRP), Demand Requirement Planning (DRP) and Enterprise Resources Planning (ERP). Besides that, it also introduces basic lean concept as part of the latest issues in manufacturing system. At the end of the course, students should be able to apply knowledge in production planning and control for managing all the resources such as man, machines, materials and time in an organization. This is to ensure the system becomes more productive, effective and efficient.

SEMI 3843 - Engineering Economy and Accounting
This course is designed to equip students to acquired engineering economy and accounting concepts, principles and methods. The focus of this course is to provide understanding on engineering economic principles and methods and to apply it in engineering field. The course

has two parts. Part 1 is designed to teach students to formulate cash-flow, perform analysis on engineering economic problems and evaluate between alternative of engineering investment/projects to make decision. Part 2 is designed to teach students to perform cost estimates using traditional and current costing techniques in production process, prepare simple financial statement and interpret financial performance of business firms for decision and control.

SEMI 4813 - Industrial System Simulation

This course is aimed to equip students with the knowledge on discrete-event simulation. A software will be utilized to model, build and run simulation models. The course cover topics on discrete-event approaches, representing uncertainty, trace driven simulation, input data analytics, modelling and building simulation models, verifying and validating simulation models, experimentation and running of simulation models, analysis of output results, etc

SEMI 4823 - Operation Research

This course provides students with the concepts and tools to model manufacturing or service systems efficiently using mainly Operations Research techniques. It focuses on formulating models based on deterministic and stochastic Operations Research techniques, applying these techniques for decision making and developing solutions from the models.

SEMI 4833 - Safety and Engineering Management

This course aims to prepare students with basic management knowledge and safety. The management part touches key issues in management and organization, management yesterday and today, strategic management, organizational structure and design, human resource management, motivating employees and leadership. In addition to these, project management aspects are included such as developing a project plan, managing risk, scheduling resources and costs, reducing project duration, and Progress and Performance Measurement. Major topic covers for safety are OSHA 1994, Factories and Machinery Act 1967, hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. For Project Management, students will be exposed with some methods of doing network for project such as CPM and PERT, lagging activities and how to calculate cost for crash project. At the end of the course, students should be able to describe fundamental aspects of management; integrate knowledge in engineering and management in making business decisions, managing a project using project management principles and techniques in planning, scheduling and controlling projects, and apply the principles of hazard identification, risk assessment/control; plan, design and implement an effective safety program.

SEMI 4843 - Facility Design

This course is designed to equip students with the basic knowledge of designing manufacturing layout facilities. Topics covered in this course include selection of the facility location, design layout procedures and algorithms, personnel requirements, line balancing, material handling and warehouse operations. At the end of the course, students should be able to design manufacturing plant layout by considering all engineering/manufacturing and supporting activities requirements, evaluate the best layout from the generated alternatives, select the best facility location, determine line balancing loss and select the best material

handling equipment for the manufacturing plant.

ELECTIVE COURSES

SEMI 4853 - Quality Engineering
This course covers process and product variation, Six Sigma, Quality Function Deployment, Failure Mode Effect Analysis, Gage Repeatability and Reproducibility, Short Run SPC and experimental methods such Taguchi Methods and Classical Experimental Designs. Students are required to work in groups to integrate these tools in solving case studies problems.

SEMI 4863 - Ergonomics and Occupational Safety
The course provides an introduction to ergonomics and occupational safety. In ergonomics, it concerns the study of human at work with the purpose of enhancing efficiency, productivity and comfort. It places human at the centre of reference with the components of machine, workspace and environment. In occupational safety, it introduces boiler, Unfired pressure vessel (UPV), hoisting machine and local exhaust ventilator (LEV) design. At the end of the course, students should be able to apply ergonomics and occupational safety principles and techniques in the design and analysis of workplace, processes and products.

SEMI 4873 - Reliability and Maintenance
This course introduces the reliability and maintenance concepts and tools. It gives an understanding about how to apply these concepts and tools at different phases of systems' and component life cycle. It covers maintenance and reliability models and to assist the decision maker in making cost effective decisions based on life cycle costing. At the system/equipment utilisation phase, it focuses on understanding how maintenance can improve the availability of processes, and how to reduce downtime through maintenance optimisation and total productive maintenance.

SEMI 4883 - Supply Chain Management and Sustainability
The course is designed for early exposure and understanding of the practical and theory in supply chain management and sustainability to the students. It guides students to develop an effective SCM strategy and its activities also the relationships that exist among a chain of firms that work together to provide a product or service. It shall cover the followings: Supply chain strategy, Sourcing strategy, logistic management, distribution management, measuringsupply chain performance, information technology in supply chain, coordination in supply chain, and sustainability. The learning process for this course will be conducted through lectures, case studies practices, discussion, audio-video presentation, group project and presentation.

BACHELOR OF MECHANICAL ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Mechanical Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualification and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on course works and final examinations given throughout the semester.

General Information

1.	**Awarding Institution**		Universiti Teknologi Malaysia
2.	**Teaching Institution**		Universiti Teknologi Malaysia
3.	**Programme Name**		Bachelor of Mechanical Engineering with Honours
4.	**Final Award**		Bachelor of Mechanical Engineering with Honours
5.	**Programme Code**		SEMMH
6.	**Professional or Statutory Body of Accreditation**		Engineering Accreditation Council (EAC)
7.	**Language(s) of Instruction**		Bahasa Melayu and English
8.	**Mode of Study (Conventional, distance learning, etc.)**		Conventional
9.	**Mode of Operation (Franchise, self-govern, etc.)**		Self-govern
10.	**Study Scheme (Full Time / Part Time)**		Full Time
11.	**Study Duration**		Minimum : 4 years Maximum : 6 years
Type of Semester		No of Semesters	No of Weeks/Semester
Normal		8	14
Short		1	8
12.	**Entry Requirements**		Matriculation / STPM / Diploma or equivalent

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (i) General (j) Language (k) Entrepreneurship (l) Co-Curriculum	 10 8 2 3	16.4%
ii.	Programme Core	105	75%
iii.	Programme Electives	12	8.6%
	Total	**140**	**100%**
Classification of courses for engineering programme			
A	Engineering Courses (i) Lecture/Project/ Laboratory (j) Workshop/Field/Design Studio (k) Industrial Training (l) Final Year Project	 94 0 5 6	75%
	Total Credit Hours for Part A	**105**	
B	Non-Engineering (i) Applied Science/Mathematic/Computer (j) Management/Law/Humanities/Ethics/Economy (k) Language (l) Co-Curriculum	 12 12 8 3	25%
	Total Credit Hours for Part B	**35**	
Total credit hours for Part A and B		**140**	**100%**
Total Credit Hours to Graduate		**140 credit hours**	

AWARD REQUIREMENTS

To graduate, students must:

- Attain a total of not less than 140 credit hours with a minimum CGPA of 2.00.
- Has passed all specified courses.
- Has applied for graduation and has been approved by the University.
- Has completed all five (5) Professional Skills Certification (PSC) courses in UTM
- Other condition as specified.

AREAS OF STUDY

Mechanical Engineering programme makes up the core of the engineering studies in the School of Mechanical Engineering. Students pursuing specialisation in a particular field shall take additional elective courses. The fundamental areas of study in mechanical engineering are described as follows:

(a) Applied Mechanics

Applied Mechanics is the application of mechanics principles to real world problems. It is a field of engineering which combines the fundamental physical sciences with mathematical, computational and experimental techniques. The term mechanics refers to the formulation of rules predicting the behaviour of physical system under the influence of any type of interaction with its environments, particularly due to the action of the forces that cause the behaviour or response of the physical system at rest (statics) or in motion (dynamics).

Applied Mechanics covers the following disciplines:

- Mechanics of Materials and Structures
- Mechanics of Machines
- Dynamic Systems and Control

The above sub-fields provide the essential knowledge which is required by the mechanical-based engineers to include Aeronautical, Automotive, Naval Architecture and Offshore Engineering, Materials, Manufacturing and Industrial Engineering counterparts.

Examples of the elective courses in Applied Mechanics are:-

- Mechanics of Composite Materials
- Failure of Engineering Component and Structures
- Mechanical Vibration
- Machine Condition Monitoring
- Noise
- Robotics

(b) Thermodynamics

Thermodynamics is taught at two levels – basic and applied. In the basic level, focus is given to the understanding of the concept of system, heat, work as well as material properties in relation to heat and work and their influence on a particular thermodynamic system. The second level involves application of theories based on thermodynamic laws in studying and analysing primary devices. Focus is on the methods of generating heat and power, minimisation of fuel usage, efficiency and other parameters. Thermodynamics is an important field, very much needed in several industrial sectors such as power generation, petrochemistry, automotive, and building maintenance. It is a course which directly involved in power generation/energy savings, different engine designs and supporting systems with high capability and cost effectiveness.

Examples of elective courses in Thermodynamics are:

- Combustion Processes
- Air Conditioning
- Internal Combustion Engine
- Heat Transfer
- Power Plant Technology

(c) Fluid Mechanics

It is a field of study which deals with fluid properties, surface hydrostatic force (examples: dam gate, reservoir, pressure and flow measurement, piping system design, potential flow and boundary layer) to determine flow type and resulting force, pumps and turbines. The principles applied include Newton's law, thermodynamic laws and basic knowledge in Mathematics. The scope of study is based on its application in the engineering field.

Examples of elective courses:

- Turbomachinery
- Hydraulic and Pneumatic Systems
- Computational Fluid Dynamics (CFD)

(d) Design

Introduction to Design

Students are exposed to the concepts and methods to develop an efficient design process and applying it to solve engineering design problems creatively and effectively.

Component Design

Students are exposed to analysis in machine design element failure theories. This includes failures due to static and fatigue loads. It involves fatigue strength and endurance level, modified stress, Goodman diagram and fatigue design under tensile and combined stresses. The content will encompass the design and selection of bolts, welding, spring, ball and roller bearings, gears and belts. At the end of the course, a student should have the capabilities to identify, analysis and design the machine elements in the perspective of static and fatigue failure aspect.

System Design

Students are able to design methodologies and principles specific to the practice of mechanical design. Emphasis is on developing efficient and effective design techniques as well as project-oriented skills from both technical and non-technical consideration. Students are able to identify and apply appropriate methodology in performing design tasks, recognise the fundamental principles of mechanical design and practices as well as formulate and apply general problem-solving strategy in the analysis of situation problem and potential problem. Students are able to identify and apply industry standards in design communication.

(e) Materials Science and Materials Technology

This course is important to engineers because it provides the basic knowledge on engineering materials such as metals, polymers, ceramics and composites so that proper materials can be selected for a particular design or product. This course relates the structure to the properties of materials so the behaviour of materials can be better understood.

CAREER PROSPECTS

Graduates of the program are expected to work in Mechanical Engineering field, one of the oldest areas of engineering activity. The career of a Mechanical Engineer involves the efficient application of physical and human resources in improving the standard of living. A Mechanical Engineer combines the basic knowledge of physical sciences and engineering education with experience and expertise to invent, design and manufacture, run and maintain mechanical

equipment, machineries and tools in all branches of industry including automotive, aerospace, marine/shipbuilding, manufacturing, processing and those involving heavy machineries. Graduates in this area can fulfil the task of an engineer cum technologist in the government, semi-government and private firms. Graduates will be able to find job opportunities in various sectors and industries as previously mentioned.

A Mechanical Engineer may further his career as a product designer, building contractor manufacturer of machines or engineering products, researcher in Research and Development (R&D) departments/institutes or an academician in institutions of higher learning. Indeed, the career of a Mechanical Engineer is deemed very versatile thus it is not surprising at all that Mechanical Engineering graduates are able to take up various relevant positions without much hassle.

MOBILITY PROGRAMME (OUTBOUND)

Universiti Teknologi Malaysia (UTM) is offering five (5) types of mobility programs which allow UTM Student to go abroad and join academic programs in universities, institutions or organizations in all over the world. The opportunities offered are as below:

1. **Study Abroad / Student Exchange**
   Study Abroad/Student Exchange programme is a programme which allow student to spend one or two semesters at universities abroad and take courses in regular semester with credit transfer opportunity.

2. **Research Internship Abroad**
   Research Internship is a program which allow student to join research study or internship under the supervision of an academic staff at universities or industries abroad from all over the world.

3. **Global Outreach Programme (GOP)**
   GOP is a 7 to 14 days academic based program to experience various cultures in other countries. It includes immersion elements such as research & academic activities, social responsibility and cross-cultural activities.

4. **International Invitation Programme**
   Students participate in program organised by international institutions/ organisations with the following themes:
   (vii) Seminar, Conference or Paper Presentation
   (viii) Cultural Exhibition and Conference
   (ix) Student Development Activity

5. **Summer School Abroad**
   Summer School program is a program which is designed to provide educational opportunities in 4 to 8 weeks during summer holiday abroad. It is related to environment, local community, heritage and tradition.

Details and appropriate forms and procedures can be reached at **UTM International link: http://www.utm.my/international/outbound-mobility-programs/**

COURSE MENU

YEAR 1: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1013	Programming for Engineers	3	
SEMM 1203	Statics*	3	
SEMM 1503	Engineering Drawing	3	
SEMM 1911	Experimental Methods	1	
SEMM 1921	Introduction to Mechanical Engineering	1	
SSCE 1693	Engineering Mathematics I	3	
UHLB 1122	English Communication Skills	2	
UHIS 1022	Philosophy and Current Issues (for Local Student Only)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilisations (for International Students Only)		
	Total	**18**	

YEAR 1 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1113	Mechanics of Solids I*	3	SEMM 1203
SEMM 1213	Dynamics*	3	SEMM 1203
SEMM 1513	Introduction to Design	3	SEMM 1503
SEEU 1002	Electrical Technology	2	
SSCE 1793	Differential Equations	3	SSCE 1693
UHMT 1012	Graduate Success Attributes	2	
UHMS 1182	Appreciation of Ethics and Civilisations (for Local Students Only)	2	
UHLM 1012	Malay Language for Communication 2 (for International Students Only)	2	
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 2 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2123	Mechanics of Solids II*	3	SEMM 1113
SEMM 2223	Mechanics of Machines & Vibration*	3	SEMM 1213
SEMM 2313	Mechanics of Fluids I*	3	SEMM 1203, SEMM 1013**
SEMM 2413	Thermodynamics*	3	
UHLB 2122	Academic Communication Skills	2	UHLB 1122
UHIT 2302	Thinking of Science and Technology	2	
	Total	**16**	

YEAR 2 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2323	Mechanics of Fluids II*	3	SEMM 2313
SEMM 2423	Applied Thermodynamics*	3	SEMM 2413
SEMM 2613	Materials Science	3	
SEMM 2921	Laboratory I	1	SEMM 1911
SEEU 2012	Electronics	2	SEEU 1002
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UKQF 2xx2	Co-curriculum and Service-Learning Elective	2	
	Total	**17**	

Subject to changes
***Core Courses – minimum passing grade is C (50%)**
Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 3 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2713	Manufacturing Processes	3	
SEMM 3023	Applied Numerical Methods	3	SEMM 1013, SSCE 1793
SEMM 3233	Control Engineering	3	SEMM 1213**, SSCE 1793**
SEMM 3242	Instrumentation	2	SEEU 2012**
SEMM 3931	Laboratory II	1	SEMM 2921
SSCE 2193	Engineering Statistics	3	
UBSS 1032	Introduction to Entrepreneurship	2	
	Total	**17**	

YEAR 3 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3033	Finite Element Methods	3	SEMM 1113**
SEMM 3253	Mechatronics	3	SEMM 1013**, SEEU 2012**
SEMM 3443	Heat Transfer	3	SEMM 2413**, SSCE 1793**
SEMM 3523	Component Design	3	SEMM 2123**, SEMM 1513
SEMM 3813	Industrial Engineering	3	
SEMM 3941	Laboratory III	1	SEMM 3931
UHLB 3162	English for Professional Purposes	2	ULAB 1122, ULAB 2122
	Total	**18**	

SHORT SEMESTER			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3915	Industrial Training	5	##, SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2423**
	Total	**5**	

Subject to changes
**** Minimum grade D- (30%) in the pre-requisite courses**
Obtained minimum of 80 credits
Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 4 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3823	Engineering Management, Safety and Economics	3	
SEMM 4533	System Design	3	SEMM 3523
SEMM 4912	Undergraduate Project I	2	SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2423**
SEMX 4xx3	Elective I	3	
SEMX 5xx3	PRISMS Elective 1		
SEMX 4xx3	Elective II	3	
SEMX 5xx3	PRISMS Elective II		
UxxX 2xx2	Generic Skills or Knowledge Expansion Cluster Elective	2	
	Total	**16**	

YEAR 4 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4902	Engineering Professional Practice	2	
SEMM 4924	Undergraduate Project II	4	SEMM 4912
SEMX 4xx3	Elective III	3	
SEMX 5xx3	PRISMS Elective III		
SEMX 4xx3	Elective IV	3	
SEMX 5xx3	PRISMS Elective IV		
UHLX 1112	Foreign Language Elective	2	
UKQT 3001	Extra-Curricular Experiential Learning (ExCEL)	1	
	Total	**15**	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

* Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

ELECTIVE COURSES

Apart from the core course, students must also take 12 credits of elective course.

Areas	Code	Elective Courses
Area 1: Mechanical	SEMM 4113	Plasticity & Application
	SEMM 4123	Structural Analysis
	SEMM 4133	Failure of Engineering Components & Structures
	SEMM 4143	Mechanics of Composite Materials
	SEMM 4153	Applied Stress Analysis
	SEMM 4163	Surface Mount Technology
	SEMM 4213	Mechanical Vibration
	SEMM 4233	Mechanisms & Linkage
	SEMM 4243	Advanced Control
	SEMM 4253	Industrial Automation
	SEMM 4273	Robotics
	SEMM 4293	Noise
	SEMM 4313	Turbomachinery

Engineering	SEMM 4323	Fluid Power
	SEMM 4333	Computational Fluid Dynamics
	SEMM 4343	Hydraulic Machine & Pipe System
	SEMM 4353	Lubrications
	SEMM 4413	Internal Combustion Engine
	SEMM 4423	Power Plant Engineering
	SEMM 4433	Refrigeration & Air Conditioning
	SEMM 4443	Thermal Fluid System Design
	SEMM 4453	Combustion
	SEMM 4463	Energy and Environment
	SEMM 4513	Computer Aided Design
Area 2: Materials	SEMM 4633	Materials Selection
	SEMB 4613	Materials Characterization
	SEMB 4623	Corrosion & Corrosion Control
	SEMB 4643	Non-Destructive Testing
	SEMB 4653	Surface Engineering
	SEMB 4663	Advanced and Functional Materials
	SEMB 4673	Materials Processing
	SEMB 4683	Nanomaterials
	SEMB 4693	Modeling in Materials Engineering
Area 3: Manufacturing	SEMP 3713	CAD/CAM
	SEMP 4013	Additive Manufacturing
	SEMP 4033	Sustainable Manufacturing
	SEMP 4753	Non-conventional Machining
	SEMP 4763	Quality Engineering and Metrology
	SEMP 4783	Casting Technology
	SEMP 4793	Product Design and Manufacture
Area 4: Industrial	SEMI 4813	Industrial System Simulation
	SEMI 4823	Operation Research
	SEMI 4843	Facilities Design
	SEMI 4853	Quality Engineering
	SEMI 4873	Reliability and Maintenance
	SEMI 4883	Supply Chain Management and Sustainability
Area 5: Prism	SEMM 5023	Product Innovation and development
	SEMM 5113	Advanced Mechanics of Composite Structures
	SEMM 5223	Advanced Industrial Automation
	SEMM 5273	Vibration measurement and control
	SEMM 5343	Friction, wear and lubrication
	SEMM 5413	Energy Management
	SEMB 5613	Advanced Materials Processing
	SEMB 5623	Smart Materials
	SEMB 5633	Assets Integrity and Management
	SEMB 5643	Structural composites
	SEMP 5713	Statistical Quality Engineering
	SEMP 5723	Green Manufacturing Technology

	SEMP 5733	Digital Manufacturing
	SEMV 5313	Advanced Vehicle Dynamics
	SEMV 5403	Internal Combustion Engine & Boosting system
	SEMV 5503	Advanced Vehicle Powertrain

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

Dyna:Mech@UTM

Dyna:Mech is an initiative by the School of Mechanical Engineering UTM which aims to strengthen the currently available Mechanical Engineering Programme, at the same time improving the employability and competitiveness of the graduates. dyna:Mech is the first of its kind in Malaysia; which no other universities in the country offer a dynamic Mechanical Engineering programme like this.

While other University-Industry collaborations involve research funding and technology transfer, the Mechanical Engineering programme in UTM takes one step further, allowing involvement of the industry in the curriculum. Our new initiative offers approximately 20 flexible credits which are based on the needs of the industry; some are taught by lecturers of the faculty, and some others by experienced personnel from the industry. The courses offered under the dyna:Mech programme to Mechanical Engineering students will be categorised into clusters according to the skillset required by specific industries. Students will also experience industrial training with industries related to the respective cluster they had chosen. Consequently, Mechanical Engineering students can experience the working world while they are still studying and will be trained with specific skills according to the current needs of the industry. This dyna:Mech initiative provides industrial benefit through reducing the period taken significantly to train and prepare the young engineers.

This collaboration between the University and industry will help students in getting an early chance to identify employment opportunities, simultaneously providing industries with the opportunity to select excellent students before they even graduate. The School of Mechanical Engineering at UTM will stop at nothing to ensure its program is always the best in Malaysia to produce outstanding engineers in the country.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO	COURSE CODE	COURSE NAME	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (/) IF PASSED
MECHANICAL ENGINEERING COURSES					
1	SEMM 1013	Programming for Engineers	3	3	
2	SEMM 1113	Mechanics of Solids I	3	3	
3	SEMM 1203	Statics	3	3	
4	SEMM 1213	Dynamics	3	3	
5	SEMM 1503	Engineering Drawing	3	3	
6	SEMM 1513	Introduction to Design	3	3	
7	SEMM 1911	Experimental Methods	1	1	
8	SEMM 1921	Introduction to Mechanical Engineering	1	1	
9	SEMM 2123	Mechanics of Solids II	3	3	
10	SEMM 2223	Mechanics of Machines & Vibration	3	3	
11	SEMM 2313	Mechanics of Fluids I	3	3	
12	SEMM 2323	Mechanics of Fluids II	3	3	
13	SEMM 2413	Thermodynamics	3	3	
14	SEMM 2423	Applied Thermodynamics	3	3	
15	SEMM 2613	Materials Science	3	3	
16	SEMM 2713	Manufacturing Processes	3	3	
17	SEMM 2921	Laboratory I	1	1	
18	SEMM 3023	Applied Numerical Methods	3	3	
19	SEMM 3033	Finite Element Methods	3	3	
20	SEMM 3233	Control Engineering	3	3	
21	SEMM 3242	Instrumentation	2	2	
22	SEMM 3253	Mechatronics	3	3	
23	SEMM 3443	Heat Transfer	3	3	
24	SEMM 3523	Component Design	3	3	
25	SEMM 3813	Industrial Engineering	3	3	
26	SEMM 3823	Engineering Management, Safety & Economics	3	3	
27	SEMM 3915	Industrial Training	5	HL	
28	SEMM 3931	Laboratory II	1	1	
29	SEMM 3941	Laboratory III	1	1	
30	SEMM 4533	System Design	3	3	
31	SEMM 4902	Engineering Professional Practice	2	2	
32	SEMM 4912	Undergraduate Project I	2	2	
33	SEMM 4924	Undergraduate Project II	4	4	

34	SEMX 4xx3	Elective I	3	3	
	SEMX 5xx3	PRISMS Elective I			
35	SEMX 4xx3	Elective II	3	3	
	SEMX 5xx3	PRISMS Elective II			
36	SEMX 4xx3	Elective III	3	3	
	SEMX 5xx3	PRISMS Elective III			
37	SEMX 4xx3	Elective IV	3	3	
	SEMX 5xx3	PRISMS Elective IV			
TOTAL CREDIT FOR MECHANICAL ENGINEERING COURSES (A)			**101**	**96**	
ELECTRICAL COURSES (School of Electrical Engineering)					
1	SEEU 1002	Electrical Technology	2	2	
2	SEEU 2012	Electronics	2	2	
TOTAL CREDIT FOR ELECTRICAL COURSES (B)			**4**	**4**	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
TOTAL CREDIT FOR MATHEMATICS COURSES (C)			**12**	**12**	
UNIVERSITY GENERAL COURSES					
CLUSTER 1: APPRECIATION OF PHILOSOPHY, VALUE & HISTORY					
1	UHIS 1022	Philosophy and Current Issues (for Local Students Only)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students Only)			
2	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
CLUSTER 2: GENERIC SKILLS					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UHMT 2012	Leadership	2	2	
3.	UHMS 2022	Critical and Creative Thinking	2	2	
4.	UHMS 2032	The Human side of Knowledge Management	2	2	
5.	UHMS 2042	Development and Global Issues	2	2	
6.	UHMT 2042	Guidance & Counselling	2	2	
7.	UHMT 2062	Psychology of Adjustment	2	2	
8.	UBSS 2072	Fundamentals of Intellectual	2	2	

		Property Law			
9.	UBSS 2082	Law for Entrepreneurs	2	2	
10.	UBSS 2092	Entrepreneurship and Enterprise Development	2	2	
11.	UBSS 2102	Social Entrepreneurship	2	2	
12.	UHMS 2112	Engineering Communication	2	2	
13.	UHMS 2122	Human Communication	2	2	
14.	UHMT 2132	Professional Ethics	2	2	
15.	UMJT 2142	Professional Ethics, Safety and Health (Ningen Ryoku)	2	2	
CLUSTER 3: KNOWLEDGE EXHANCEMENT					
1.	UHIT 2302	Science and Technology Thinking	2	2	
2.	UHIT 1022	Science, Technology and Mankind	2	2	
3.	UHII 2012	Al-Qur'an and Human Civilization	2	2	
4.	UHIT 2032	Life Institutions and Sustainable Development	2	2	
5.	UHIZ 2042	Future Studies	2	2	
6.	UHIT 2052	Family Law	2	2	
7.	UHIZ 2062	World Science	2	2	
8.	UHIS 2072	Sustainable Economy	2	2	
9.	UHIS 2082	Practice and Concept of Halal Management	2	2	
10.	UHII 2092	Philosophy of Islamic Art	2	2	
11.	UHII 2102	Islam and Health	2	2	
12.	UHII 2132	Islamic Entrepreneurship	2	2	
13.	UETS 2142	Sustainable Energy	2	2	
CLUSTER 4: CO-CURRICULUM & SERVICE LEARNING					
1	UKQF 2xx2	Co-curriculum & Service-Learning Elective	2	2	
2	UKQT 3001	Extra-Curricular Experiential Learning	1	1	
CLUSTER 5: LANGUAGE SKILLS					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHLB 1032	Introductory Academic English	2	2	
5	UHLB 1042	Intermediate Academic English	2	2	
6	UHLA 1112	Arabic Language	2	2	
7	UHLJ 1112	Japanese Language 1	2	2	
8	UHLC 1112	Mandarin Language I	2	2	
9	UHLF 1112	French Language	2	2	
10	UHLN 1112	Persian Language	2	2	
11	UHLJ 1122	Japanese Language for	2	2	

		Communication I			
12	UHLM 1112	Malay Language for Communication	2	2	
CLUSTER 6: ENTREPRENEURSHIP					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSES (D)			**23**	**23**	
TOTAL CREDIT TO GRADUATE (A + B + C + D)			**140**	**135**	
Note: # Choose one elective either from Cluster 2 (Generic Skills) or Cluster 3 (Knowledge Expansion) for UxxX 2xx2					
OTHER COMPULSORY COURSES					
OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATION (PCS) • **Students are required to enrol and pass FIVE (5) PCS courses, in order to be eligible to graduate** • **Please refer to page FE 8 in UG Academic Handbook, for more information about PSC courses.**					
Compulsory PSC Courses (Enrol all 3 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
Elective PSC Courses (Choose 3 only)					
1	GSPX XXXX	Data Analytic for Organization			
2	GSPX XXXX	ISO 9001:2015 Quality Management System Requirement			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	How to Manage Your Personal Finance			

COURSE SYNOPSIS

CORE COURSES

SEMM 1013 - Programming for Engineers

This course formally introduces the concept of computers, algorithms, programming languages, pseudo-code, and design of programs for solution to computational engineering problems. The two programming languages introduced in this course are C and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting and model building.

SEMM 1113 - Mechanics of Solids I

The course provides students with the knowledge to determine the strength and stiffness of engineering structures being used. The structures that will be used in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SEMM 1203 - Statics

This course introduces students to the part of mechanic which is a pre-requisite for most engineering courses including SEMM 1213, SEMM 2313 and SEMM 1113. The course enables student to acquire the essential basic knowledge of resultant and equilibrium of forces. It will examine key elements in producing free body diagrams for particles and rigid bodies, as essential first step in solving applied mechanics problems. Exposure to the concept of moment and equilibrium equations with reference of Newton's Law enhances the relevance of friction, trusses, frames and machines applications. Students are also introduced to the concept of distributed forces, which include centroid and centre of gravity and the generated surface area and volume of revolution. Hence, students will be able to demonstrate and apply the knowledge in continuing subjects which requires the analytical skills developed in this subject.

SEMM 1213 - Dynamics

The course is an extension to SEMM 1203, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces energy and power to move a body.

SEMM 1503 - Engineering Drawing

This subject introduces student to the use of technical drawing in an effective way for communicating and integrating with engineering concepts. Such environment will provide a platform where the engineer can share and exchange information. This subject will also enlighten the student on the significant changes in the engineering and technical graphic due to the use of computer and CAD (Computer Aided Design) software. At the end of the course, student should be able to apply the skill and knowledge of engineering drawing to interpret design, using graphics method such as geometric drawing, orthographic projection, isometric, machine drawing, detailed drawing, and basic CAD software.

SEMM 1513 - Introduction to Design

This course is designed to introduce students to the concepts and methods of engineering design process in solving engineering design problems, creatively and effectively. The design process introduces problem background, concept generations and selections, development of selected concept and testing of selected concept by constructing and testing a prototype. This course serves as a preparation for students to proceed to higher level design classes.

SEMM 1911 - Experimental Methods

This course is conducted via lectures and experimental case study data. Students are exposed to the experimental method theory for the initial weeks and then followed by case study data. The lecture contents shall cover the fundamental of experimental method and the basic principles in measurements, instrumentation and analysis of results. It shall focus on the design of mechanical experiments, selection of sensors and transducers, estimation of errors and display of results. It shall also cover the analysis of results and how to prepare proper report writing. Student comprehension will be tested in two written tests. Based on the given experimental data, students are also expected to conduct statistical analysis of results and write the experimental outcome in a report.

SEMM 1921 - Introduction to Mechanical Engineering Profession

This course comprises of two modules intended to introduce students to the field of mechanical engineering. The first module raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of generic skills to engineers. It also provides students with a clear overview of different fields within Mechanical Engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skill required for an engineer entrepreneur. This course introduces students to the field of mechanical engineering. It raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of both technical and generic skills to mechanical engineers. It also provides students with a clear overview of different fields within mechanical engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skills required for an engineering entrepreneur.

SEMM 2123 - Mechanics of Solids II

The course is an extension to SEMM 1113, which is the pre-requisite to this course. It aims to extend the student's knowledge and understanding of the behaviour of materials and structures under a variety of loading conditions. The course starts off with plane stress and plane strain transformation, following which several elastic failure criteria's are investigated. The course provides an opportunity to investigate thick cylinders, structural deformation behaviour by using the energy method, instability problems of struts and elasto-plastic bending of beams. Determinate and indeterminate problems will be examined. At the end of the course, students should be able to calculate and evaluate stress, strain and deformation of structures in torsion and bending. They should also be able to evaluate failure modes and estimate fracture life of structures and components. The aspect of designing safe components and structures shall also be emphasized to the students.

SEMM 2223 - Mechanics of Machines and Vibration

The course requires SEMM 1213 as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines which include belt and pulley systems, gears, flywheels, governors and gyroscopes. Students will also be exposed to the methods of balancing rotating masses and parts of a combustion engine. The concept of vibration with respect to one-degree-freedom is also studied. At the end of the course, the students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

SEMM 2313 - Mechanics of Fluids I

The principle aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behaviour and flow. It will emphasize on the concept of pressure, hydrostatic pressure equation and its application in the measurement of pressure, static force due to immersed surfaces, floatation and buoyancy analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduce specially to solve flow measurement, mass or volumetric flow rate, momentum in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate an ability to analyze whether statically, dynamically or kinematically problems related directly to fluids.

SEMM 2323 - Mechanics of Fluids II

This course is designed to enhance the basic knowledge that has been developed in the first stage of Fluid Mechanics and expose the students in analysing hydrodynamically the flow field. It will emphasize on the analysis and the importance of ideal, boundary layer, and compressible flow in a practical engineering application. The course will also provide the analysis of flow through fluid machines such as pump and turbine. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to flow of fluids.

SEMM 2413 - Thermodynamics

Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle expressed in the First Law of Thermodynamics will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

SEMM 2423 - Applied Thermodynamics

The aim of this course is to teach second-year mechanical engineering students on the application of thermodynamics principles to evaluate the performance criteria of various thermal systems. These include the reciprocating air-compressor, internal combustion engines, vapour power plants, gas turbine plants and refrigeration systems. Also, principles of conservation of mass and energy are applied to various air-conditioning processes to assess the properties changes and energy transfer during the processes.

SEMM 2433 - Applied Thermodynamics & Heat Transfer

This course aims to develop a fundamental understanding of the processes by which heat and energy are inter-related and converted and by which heat is transferred. The course will review major principles of energy conversion and the modes of heat transfer. The basic laws of thermodynamics and the governing equations for heat transfer and thermodynamics will be introduced and subsequently used to solve practical engineering problems involving thermodynamics and heat transfer. The course will also cover fundamental principles of power generation systems.

SEMM 2613 - Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers and composites and their fundamental structures. The course will also provide basic diffusion mechanisms, metal solidification phase diagrams and heat treatment processes. At the end of the course, students should be able to apply the knowledge of atomic bonding and crystal structures to predict the physical and mechanical behaviour of materials and use the principlesof phase diagrams and heat treatments to the design of materials and their properties.

SEMM 2713 - Manufacturing Processes

This course discusses the fundamental aspect of various traditional and non-traditional manufacturing processes for metal and non-metal components. It starts from the overall introduction on manufacturing aspects followed by polymer shaping processes, casting processes, joining processes, metal forming processes and machining processes including CNC and CAM. At the end of this course, the students should be able to select suitable manufacturing processes to produce a part/product. The knowledge gained from this course also allows students to make right decision in designing products based on process requirements.

SEMM 2921 - Laboratory I

This course is introduced in the second year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It consists of six laboratories; Strengths of Materials Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluid Laboratory. Students will be grouped into 5 to 6 people for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3023 - Applied Numerical Methods

This course formally introduces the steps involved in engineering analysis (mathematical modelling, solving the governing equation, and interpretation of the results). Examples of case studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and partial differential equation are introduced.

SEMM 3033 - Finite Element Methods

This course gives students an exposure to the theoretical basis of the finite element method and its implementation principles, and introduces the use of general purpose finite element software for solving real-life engineering problems.

SEMM 3233 - Control Engineering

The course shall cover the essential and basic theory of control engineering. It shall cover the followings: open and closed-loop systems, manipulation of block diagram, signal flow graph and *Mason*'s rule, concept of transfer function, time response analysis, classification of system, control action, stability analysis, *Routh* criteria, root locus method, frequency analysis, *Nyquist* and *Bode* plots, relative stability from *Nyquist* and *Bode* diagrams and design of control system. MATLAB and Simulink software package shall be taught and used as a tool in solving control engineering problems where appropriate.

SEMM 3242 - Instrumentation

The course shall cover the essential and basic theory of instrumentation for undergraduate. It shall cover the following: fundamentals and components of instrumentation system, characteristics of instrumentation system, signal conditioning and application of sensors in measurements.

SEMM 3253 - Mechatronics

The course provides students with an introduction to mechatronics and its application. It will examine a number of key topics of mechanical engineering, electrical/electronic and computer control disciplines with an emphasis on the integrated approach. At the end of the course, students should be able to explain the concept of mechatronics and related components, identify specific sensor and actuator for mechatronic application, apply the concepts of PLC, microcontroller and Data Acquisition System (DAS), controller design and integration, and mechatronic system design.

SEMM 3443 - Heat Transfer

In this course, conduction, convection and radiation, the three basic modes of heat transfer will be covered. Emphasis will be on developing a physical and analytical understanding of the three modes of heat transfer, as well as its applications. Students will develop an ability toapply governing principles and physical intuition to solve single and multi-mode heat transfer problems. This course also introduces methods for calculating rates of heat transfer by these three modes.

SEMM 3523 - Components Design

This course is designed to expose students in analysing machine design element failure theories. This includes failure due to static and fatigue loads. It involves fatigue strength and endurance level, modified stress Goodman diagram and fatigue design under tensile and combined stresses. The content will encompass the design and selection of bolts, welding, spring, ball and roller bearing, gears and belts. At the end of the course, students should have the capabilities to identify, analyse and design the machine elements in the perspective of static and fatigue failure aspect.

SEMM 3622 - Materials Technology

This course introduces students to the basic concepts required to understand and describe the mechanical behaviour and failure mechanism of metals. It will emphasise on the concept of stress intensity factor and fracture mechanics to predict failure of materials and provide understanding on conditions under which fatigue, and creep occur. The course will also introduce students to the theory of electromechanical corrosion in metallic materials, estimate the corrosion rate and understand the methods to control and manage corrosion. By the end of the course, students should be able to apply the criteria of failure to the design of materials and conduct failure analysis of engineering components. This course also covers the properties, processing and applications of non-metallic materials mainly polymer, ceramic and composite.

SEMM 3623 - Materials Engineering

This course is designed to introduce students to the concept of fracture mechanics and how engineering materials respond to mechanical loads. The failure behaviour of engineering materials will cover fracture, fatigue, creep, wear and corrosion. The course will also provide students with knowledge of how to conduct failure analysis and determine the root cause of failure under different mechanical loading. The mechanical behaviour of polymeric materials, ceramics and composites will also be covered examples of case studies as well of selecting engineering materials for specific product designs.

SEMM 3813 - Industrial Engineering

This course introduces students to various theories, principles and the importance in the area of industrial engineering and project management. It covers issues related to productivity, quality, work study, ergonomics, facilities planning and project scheduling. The contents give some brief exposure on the concept and application of overall discipline for an industrial engineer. Some calculations or measurements are introduced as an approach before deciding the best alternative. Students should be able to describe fundamental aspects of project management and integrate knowledge in engineering and project management. In project

management, students are exposed to several steps in developing project plan, managing risks, scheduling resources reducing project duration, and progress and performance measurement. At the end of the course, students should be able to apply various concept and tools in selecting the best alternative in terms of man, machine, materials, method and management and planning and monitoring engineering projects.

SEMM 3915 - Industrial Training

Industrial training exposes students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning that requires the students to learn the process and able to apply their knowledge acquired in class in actual industrial setting. The knowledge acquired during practical training may be used later in final year classes as well as to equip them with sufficient knowledge for job interviews.

SEMM 3931 - Laboratory II

This course is introduced in the third year of Mechanical Engineering programme involving two hours per week and experimental based courses. It consists of six laboratories; Strength of Materials Laboratory, Thermodynamics Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluids Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3941 - Laboratory III

This course is introduced in the third year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It is divided into two parts; experimental work at System & Control and Vibration Laboratories and a problem- based-learning (PBL) laboratory (module) depending on the topics/labs facilitated by a lecturer. Students have to produce a short report for the experimental work similar to those in Laboratory I and II. The second part, i.e., the lab module is based on the PBL concept. Student have to plan and design their own experimental work right from the very beginning until the end of the module based on the topics given by the lecturer. Students will be grouped into 5 to 6 for each module. In general, every group have to conduct two experimental works and two modules. At the end of the session, students have to submit two short reports and two formal reports.

SEMM 4533 - System Design

This course is designed for students to gain detailed topical exposure to design methodologies and principles specific to the practice of mechanical design. Emphasis is on developing efficient and effective design techniques as well as project-oriented skills from both technical and non-technical considerations. At the end of this course, students should be able to identify and apply appropriate methodologies in performing design tasks, recognize the fundamental principles of mechanical designs and practices, formulate and apply general problem-solving strategies in the analysis of situations and potential problems and apply relevant industry standards in design. Student should also be able to communicate ideas and solutions in verbal

and written forms by means of oral presentation and technical report.

SEMM 4823 - Engineering Management, Safety and Economics
This course aims to prepare students with basic management knowledge, safety and engineering economy. The management part will examine key issues in management and organization, past management and today, strategic management, organizational structure and design, human resource management, motivating employees and leadership. Major topics covered under safety are OSHA 1994, Factories and Machinery Act 1967, hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. In engineering economy, students are exposed to engineering economic principles and methods of engineering economic analysis. At the end of the course, students should be able to describe fundamental aspects of management; integrate knowledge in engineering and management in making business decisions; apply the principles of hazard identification, risk assessment/control; plan, design and implement an effective safety program; and also perform engineering economic analysis to solve problems and evaluate engineering investment/projects.

SEMM 4902 - Engineering Professional Practice
This course introduces students to engineering ethics and an engineer's responsibilities towards safety, health and welfare of the public. It emphasizes on the engineer as a professional man, engineers & society, code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practice. The course will also introduce students to organize, in a group, a community service activity in a planned and structured manner. At the end of the course, students should be able to demonstrate and apply engineering professional ethics in their career as an engineer.

SEMM 4912 - Undergraduate Project I
This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given a topic on a project, students have to identify a problem, gather relevant information to the problem and propose solutions to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

SEMM 4924 - Undergraduate Project II
This course is the continuation of Undergraduate Project (UGP). It enhances the students' knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and the ability to plan and manage their work effectively. This course will also develop the students' capability to present, discuss and analyse results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

ELECTIVE COURSES

SEMM 4113 - Plasticity and Applications

This course addresses the background of metal under plastic behaviour and their possible generalizations under combined stresses. It aims to enhance the student's knowledge and understanding of the plastic behaviour of materials under various loading conditions particularly in 3D state of stresses. Plastic behaviour due to variety hardening rules and their characteristics has been extended to comprehend the deformation of structures under loading and unloading states. The course also provides an opportunity to examine in-depth plastic bending and torsion behaviour of metal with hardening rules. For inclusion of safety design aspect, the yield and failure criteria analysis for evaluating plastic behaviour has also been introduced. To enhance student's understanding on theory to practice aspect, plasticity analysis of beam and frame is included to fundamentally analyse a complicated structure. It also deals with the current technologies and analyses in various applications namely sheet metal forming, blanking, stamping, cup-drawing, indentation, stretching and drawing over a radius, wire drawing, extrusion and pultrusion processes. For practical purposes, students will be given chances to visit metal stamping industry via technical visit. Commercial finite element software will be introduced in this course to simulate any plasticity problems. At the end of the course, the student should be able to analyse and state the loading and unloading behaviour of metal materials with the hardening rules. They should also be able to analyse the plastic bending and torsion, the stresses and strains in 3-D as well as apply the yield and failure criteria analysis for plastic applications. From engineer point of view, they should have a capability to present, differentiate and enlighten various processes using established technologies

SEMM 4123 - Structural Analysis

This course builds upon the materials covered in Solid Mechanics I and II, to develop an understanding of structural behaviour. Matrix analysis methods are used as the basis for modern, computer-based structural analysis. Analytical techniques are used to analyse trusses, beams, frames, flat plates and curved shells.

SEMM 4133 - Failure of Engineering Components and Structures

This course presents a systematic approach in performing failure analysis of engineering components and structures. It reviews basic engineering knowledge of the mechanics of materials, fracture mechanics and engineering materials for applications to failure analysis. Cases studies involving different types of failures including static overload, low and high cycle fatigue, creep and creep rupture, buckling of slender structures and fatigue crack growth are considered. Rationale and justification on the proposed causes of failure are critically discussed. Writing of failure analysis report is coached. (Optional) Computational approach (FE simulation) for relevant cases is introduced.

SEMM 4143 - Mechanics of Composite Materials

This course introduces students to some major views and theories in the area of composite materials especially in the polymer based composite learning with emphasis on the types of materials, production methods, failure analysis and the mechanics of laminated composites. It will examine some key issues in the mechanics of laminated composites with special focus

on the stress-strain relationship and interaction to the extensional, coupling and bending stiffness matrices in promoting learning. Sandwich structures and interlaminar fracture toughness will also be included in this syllabus. The course will also provide a visit to industries dealing with polymer based composite materials in order the students to understand more regarding the practical sides of the subject.

SEMM 4153 - Applied Stress Analysis

In this course students learn the fundamental concept of elasticity and apply modern experimental stress analysis techniques to measure strains and stresses in engineering components and structures. Topics include stress, strain and displacement, equilibrium and compatibility, use of Airy stress function in rectangular and polar coordinates, stress field, plane stress and plain strain, torsion of prismatic thin-walled bars, combined bending, shear and torsion in beams, plane stress in membrane loaded plates, strain gauge technology and photo elasticity.

SEMM 4163 - Surface Mount Technology

This course presents an overview of surface mount electronics packaging. The scope covers identification of surface mount components and printed circuit board, description of surface mount technology processes, reliability aspects and manufacturing practices.

SEMM 4213 - Mechanical Vibration

Fundamental of vibration analysis of 1, 2 and multi DOF mechanical systems including the effects of damping; free response; the significance of natural modes, resonance frequency, mode shape, and orthogonality; vibration absorbers and isolators; introduction to vibration measurement. A measurement project involves the use of an accelerometer, signal conditioning and analysis instrumentation.

SEMM 4233 - Mechanisms and Linkages

This course is designed to introduce the concept and techniques of analysing and synthesizing motion in mechanism and machines. The student shall use the concept of velocity and acceleration done during their first year to analyse the motion of mechanisms. Topics for practical application include linkages and mechanisms, design of mechanisms, cam and follower, and kinematics of different types of gear.

SEMM 4243 - Advanced Control

The course shall cover the essential and basic theory of design and analysis of control system that are not covered by SKMM3233. It shall cover the followings: Cascade compensation using lead and lag compensator, non-linear system analysis, discrete system and state-space analysis. MATLAB and Simulink software package shall be taught and used as a tool in solving control engineering problems throughout the course.

SEMM 4253 - Industrial Automation

The course shall introduce the students to the methods, tools, and technologies used to automate a product or a system. Primary automation technologies include sensors and actuators technology, automation actuators, logic and sequence control, and in-depth industrial controller are covered in this course. An introduction to artificial intelligence for

industrial application is also introduced.

SEMM 4273 - Robotics

This course is designed to enable the students at undergraduate level to develop the necessary insight into the area of robotics. It will examine the fundamental elements of robot system related to anatomy and configuration, robot main components, programming feature and methods and robot's performance specifications. The students are expected to acquire analytical skills through the analyses of robot manipulators related to their kinematics, statics and dynamics which typically constitute the important prerequisites to designing the mechanical structure, planned trajectory path and control aspects. The robot control topic that is included in the later section provides a platform for the students to explore various control algorithms that address the stability, accuracy and robustness of the systems. Particular emphasis is laid on the mathematical modelling and simulation of the control schemes. A number of case studies pertaining to selected robotic systems are expected to further strengthen the students understanding and insight into the actual systems.

SEMM 4293 - Noise

This course prepares the future engineers with the physical principles of noise together with the tools and analysis techniques for noise measurements. Students will be taught on the physics of sound, measurement instrumentations, analysis techniques, sound/noise inside room & enclosure, transmission of sound/noise through structure and outdoor sound/noise. Students will also be introduced and exposed to the typical noise measurement instrumentations available in the noise laboratory. International and domestic noise regulations are also highlighted. The project/s assigned to students during this course requires understanding on the basic principles of noise along with the use of noise measurement instrumentations and data analysis. At the end of this course, students should understand thoroughly all the underlying physical principles of noise and should be able to measure and analyse noise levels whenever required.

SEMM 4313 - Turbomachinery

This course is designed to provide students a fairly broad treatment of the fluid mechanics of turbomachinery. Emphasis is placed on the more utilitarian equipment, such as compressors, blowers, fans, pumps and wind turbines that will be encountered by most mechanical engineers as they pursue careers in industry. The course covers the basic fundamentals of fluid mechanics needed to develop and manipulate the analytical and empirical relationships and concepts used in turbomachinery, analysis of flow through several fluid machines, selection of fluid machine type that best suited for a specified task and preliminary estimation of speed, size, and perhaps other performance characteristics. At the end of the course, students should be able to compare and chose fluid machines for various operations.

SEMM 4323 - Fluid Power System

This course introduces the theory and practical aspects of hydraulic and pneumatic systems, and their related issues. Students will be exposed to the function and operation of each system components, all related symbols and construction of circuits. Students will be able to carry out calculations to determine the size of components and their performance. Basic knowledge from this course will be able to guide students in order to select appropriate components,

design simple circuits, handle and maintain the actual system in industrial sectors. Safety aspect as well as act and regulations in relation to hydraulic and pneumatic systems are introduced to highlight and promote safe and healthy working conditions.

SEMM 4333 - Computational Fluid Dynamics

This course introduces students to fundamentals and practical skills of Computational Fluid Dynamics (CFD). The governing equations of fluid flow and their mathematical classification are introduced. The course will also provide the basic concept of CFD and numerical procedures such as Finite Difference Method (FDM) and Finite Volume Method (FVM). Student are also exposed to practical issues associated with the implementation of the use of CFD codes, such as turbulence modelling, boundary conditions, and the importance of verification and validation. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to complex flow of fluids using open source and commercial CFD codes.

SEMM 4343 - Hydraulics Machines and Pipes System

This course is designed to enhance the basic knowledge that has been developed in Mechanics of Fluids 1 through the understanding on the principle of open channel flow and its flowrates calculation. Basic elements of water flow in pipes which are applied to practical problems in pipelines and networks for steady, quasi-steady and unsteady flow are emphasized. Students will be exposed with the flow distribution analysis through the use of Hardy-Cross method, pressure wave analysis, water hammer analysis, pump operation and pipe system analysis. This course will also cover the analysis of various pump type such as centrifugal pump, axial pump and positive displacement pump. At the end of this course, students should be able to demonstrate an ability to analyse problems related directly to fluids in hydraulic machines and pipe systems.

SEMM 4353 - Lubrication

The principle aim of this course is to provide students with an understanding of physical principles of the classic theory of hydrodynamic lubrication as a basis for bearing design; application to simple thrust and journal bearings and pads of various geometries; and hydrostatic lubrication. Students will be introduced to types of hydrodynamics bearings and bearing operation; properties of lubricant; theory of steady state hydrodynamic lubrication; hydrostatic and squeeze film lubrication applied to slider and journal bearings, bearing design with side leakage; and thermal balance.

SEMM 4413 - Internal Combustion Engines

This course is intended to provide students an introduction, terminology, definition, and operating characteristics of internal combustion engines (ICE). It covers all topics needed for a basic engineering knowledge of the design, operation, analysis and performance of ICE. Principles of all types of ICE are covered including spark ignition (gasoline), compression ignition (diesel), four-stroke, and two-stroke engines. On top of that, students will be equipped with basic knowledge and understanding of engine heat transfer, frictions and lubrication. Moreover, an introduction on fuel-cell, hybrid and other alternative fuels are also covered.

SEMM 4423 - Power Plant Engineering

The study of power plant technology is one of the important fields of engineering science. Power plant technology problems are of great importance in many branches of engineering such as mechanical, chemical, nuclear and electrical. In this course economizers, steam generators, fuel and combustion, gas turbines, combined cycles and environmental consideration will be covered in detail. The emphasis will be laid on both analytical techniques and physical understanding of the subjects.

SEMM 4433 - Refrigeration and Air Conditioning

Refrigeration is the process of removing heat from an enclosed space, or from a substance, and moving it to a place where it is unobjectionable. The primary purpose of refrigeration is lowering the temperature of the enclosed space or substance and then maintaining that lower temperature. Probably the most widely used current applications of refrigeration are for the air conditioning of private homes and public buildings, and the refrigeration of foodstuffs in homes, restaurants and large storage warehouses. The importance of refrigeration system and air conditioning system in domestic, commercial and industrial sectors, for both comfort and process applications, cannot be over emphasized. Advances in electronics, communications, computers, medicine, etc. demand stringently controlled air conditions. Food refrigeration from small domestic refrigerators to large cold storages is important to avoid spoilage, thus prolonging its shelf life. Thus, refrigeration and air conditioning system play an important role in this modern world.

SEMM 4443 - Thermal Fluid System Design

The course first reviews fundamentals of fluid mechanics, thermodynamics and heat transfer which are necessary basis for design of thermal fluid systems - heat exchanging devices. Cooling and heating components require fast and accurate design procedure towards effective and efficient systems considering global concerns towards our sustainable environment. The course provides a systematic approach in the basic principles, component identification and description, solution approach, modelling, and optimization (where applicable) of general macro-to-micro design of heat exchanging devices in the present and future applications. This is followed by the theory and design of specific heat exchangers. Heat exchangers are vital in power producing plants, process and chemical industries, and in heating, ventilating, air-conditioning, refrigeration systems, and cooling of electronic systems. This course provides a systematic approach to the understanding on the design, selection and analysis of heat exchangers with focus on the selections, thermo-hydraulic designs, design processes, ratings, and operational problems of various types of heat exchangers.

SEMM 4453 - Combustion

Students will be exposed to the concepts and the basic combustion processes. Various aspects of combustion such as the thermodynamics of combustion, the chemical kinetics, transport phenomena, Rankine-Hugoniot theory, Chapman-Jouguet waves, deflagration, detonation, diffusion flames, premixed flames, flammability, ignition and quenching will be discussed. Chemical processes that lead to various emissions and pollutant formation as well as strategies for mitigation the pollutants produced from combustion process will be stressed at later part of this course. Students will also explore various practical aspects of combustion processes.

SEMM 4463 - Energy and Environment

Energy is the basic input to build, operate and maintain all kinds of engineering infrastructures and services. Energy is also appeared as a major actor for contemporary local and global-level environmental and societal challenges. Engineers, as being the major stockholders of energy, should have sufficient knowledge on how to protect the environment in building-up and maintaining of infrastructure for operating various engineering production, operation and services. This course provides training to the students in perceiving environmental and societal consequences causing from handling of energy in infrastructures, products, and services. The course also gives lessons to the engineering students on how to protect the environment through the stat-of-the art practices such as energy efficiency, alternative energy, emission accounting, emerging technologies etc. The course focuses on issues that are multidisciplinary in nature, and therefore, the course is well suited to the students of all branch of mechanical, electrical, chemical, and environmental engineering. After successful completion of this course, students would be able to apply the acquired knowledge to work out environmental implications in dealing with energy related services and play appropriate role to serve the environmental and societal interests by minimizing the negative impacts.

SEMM 4513 - Computer Aided Design

This course is designed for students to gain knowledge on what is going on behind the screen of Computer Aided Design Software. This understanding makes the learning curve of new CAD software shorter as the students may be using other CAD software later when they work. Furthermore, the course will also expose the students on the capability of the programming within CAD software. With the programming knowledge, students will be able to model as well as using the programming to integrate engineering knowledge to CAD.

BACHELOR OF MECHANICAL ENGINEERING (MANUFACTURING) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Mechanical Engineering (Manufacturing) is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualification and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on course works and final examinations given throughout the semester.

General Information

1.	**Awarding Institution**		Universiti Teknologi Malaysia
2.	**Teaching Institution**		Universiti Teknologi Malaysia
3.	**Programme Name**		Bachelor of Mechanical Engineering (Manufacturing) with Honours
4.	**Final Award**		Bachelor of Mechanical Engineering (Manufacturing) with Honours
5.	**Programme Code**		SEMPH
6.	**Professional or Statutory Body of Accreditation**		Engineering Accreditation Council (EAC)
7.	**Language(s) of Instruction**		Bahasa Melayu and English
8.	**Mode of Study (Conventional, distance learning, etc.)**		Conventional
9.	**Mode of Operation (Franchise, self-govern, etc.)**		Self-govern
10.	**Study Scheme (Full Time / Part Time)**		Full Time
11.	**Study Duration**		Minimum : 4 years Maximum : 6 years
Type of Semester		No of Semesters	No of Weeks/Semester
Normal		8	14
Short		1	8
12.	**Entry Requirements**		Matriculation / STPM / Diploma or equivalent

Course Classification

No	Classification	Credit Hours	Percentage
i.	University Courses (m) General (n) Language (o) Entrepreneurship (p) Co-Curriculum	 10 8 2 3	16.4%
ii.	Programme Core	99	70.7%
iii.	Programme Electives	18	12.9%
	Total	**140**	**100%**
Classification of courses for engineering programme			
A	Engineering Courses (m) Lecture/Project/ Laboratory (n) Workshop/Field/Design Studio (o) Industrial Training (p) Final Year Project	 94 0 5 6	75%
	Total Credit Hours for Part A	**105**	
B	Non-Engineering (m) Applied Science/Mathematic/Computer (n) Management/Law/Humanities/Ethics/Economy (o) Language (p) Co-Curriculum	 12 12 8 3	25%
	Total Credit Hours for Part B	**35**	
Total credit hours for Part A and B		**140**	**100%**
Total Credit Hours to Graduate		**140 credit hours**	

AWARD REQUIREMENTS

To graduate, students must:

- Attain a total of not less than 140 credit hours with a minimum CGPA of 2.00.
- Has passed all specified courses.
- Has applied for graduation and has been approved by the University.
- Has completed all five (5) Professional Skills Certification (PSC) courses in UTM
- Other condition as specified.

MOBILITY PROGRAMME (OUTBOUND)

Universiti Teknologi Malaysia (UTM) is offering five (5) types of mobility programs which allow UTM Student to go abroad and join academic programs in universities, institutions or organizations in all over the world. The opportunities offered are as below:

1. **Study Abroad / Student Exchange**
   Study Abroad/Student Exchange programme is a programme which allow student to spend one or two semesters at universities abroad and take courses in regular semester with credit transfer opportunity.

2. **Research Internship Abroad**
   Research Internship is a program which allow student to join research study or internship under the supervision of an academic staff at universities or industries abroad from all over the world.

3. **Global Outreach Programme (GOP)**
   GOP is a 7 to 14 days academic based program to experience various cultures in other countries. It includes immersion elements such as research & academic activities, social responsibility and cross-cultural activities.

4. **International Invitation Programme**
   Students participate in program organised by international institutions/ organisations with the following themes:
   (x) Seminar, Conference or Paper Presentation
   (xi) Cultural Exhibition and Conference
   (xii) Student Development Activity

5. **Summer School Abroad**
   Summer School program is a program which is designed to provide educational opportunities in 4 to 8 weeks during summer holiday abroad. It is related to environment, local community, heritage and tradition.

Details and appropriate forms and procedures can be reached at **UTM International link: http://www.utm.my/international/outbound-mobility-programs/**

COURSE MENU

YEAR 1: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1013	Programming for Engineers	3	
SEMM 1203	Statics*	3	
SEMM 1503	Engineering Drawing	3	
SEMM 1911	Experimental Methods	1	
SEMM 1921	Introduction to Mechanical Engineering	1	
SSCE 1693	Engineering Mathematics 1	3	
UHLB 1112	English Communication Skills	2	
UHIS 1022	Philosophy and Current Issues (for Local Student Only)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilisations (for International Students Only)		
	Total	**18**	

YEAR 1: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1113	Mechanics of Solid I*	3	SEMM 1203
SEMM 1213	Dynamics*	3	SEMM 1203
SEMM 1513	Introduction to Design	3	SEMM 1503
SEEU 1002	Electrical Technology	2	
SSCE 1793	Differential Equations	3	SSCE 1693
UHMS 1182	Appreciation of Ethics and Civilisations (for Local Student Only)	2	
UHLM 1012	Malay Language for Communication 2 (for International Student Only)	2	
UHMT 1012	Graduate Success Attributes	2	
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 2: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2123	Mechanics of Solid II*	3	SEMM1113
SEMM 2223	Mechanics of Machines and Vibration*	3	SEMM1213
SEMM 2313	Mechanics of Fluid I*	3	SEMM 1203, SEMM 1013
SEMM 2413	Thermodynamics*	3	
UHLB 2122	Academic Communication Skills	2	UHLB 1122
UHIT 2302	Thinking of Science and Technology	2	
	Total	**16**	

YEAR 2: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2323	Mechanics of Fluid II	3	SEMM 2313
SEMM 2433	Applied Thermo & Heat Transfer	3	SEMM 2413
SEMM 2613	Materials Science	3	
SEMM 2713	Manufacturing Processes	3	
SEMM 2921	Laboratory I	1	SEMM 1911
SEEU 2012	Electronics	2	SEEU 1002
SSCE 1993	Engineering Mathematics II	3	SSCE1693
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 3: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3233	Control Engineering	3	SEMM 1213**, SSCE 1793**
SEMM 3623	Materials Engineering	3	SEMM 2613**
SEMM 3813	Industrial Engineering	3	
SEMM 3931	Laboratory II	1	SEMM 2921
SEMP 3713	CAD/CAM	3	
UKQF 2xx2	Co-curriculum and Service-Learning Elective	2	
UBSS 1032	Introduction to Entrepreneurship	2	
	Total	**17**	

YEAR 3: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3023	Applied Numerical Methods	3	SEMM 1213, SSCE 1793
SEMM 3242	Instrumentation	2	SEEU 2012**
SEMM 3523	Component Design	3	SEMM 2123**, SEMM 1513
SEMM 3823	Engineering Management, Safety & Economy	3	
SEMM 3941	Laboratory III	1	SEMM 3931
SSCE 2193	Engineering Statistic	3	
UHLB 3132	Professional Communication Skills	2	UHLB 1122, UHLB 2122
	Total	**17**	

YEAR 3: SHORT SEMESTER			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3915	Industrial Training	5	##, SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
	Total	**5**	

Subject to changes
**** Minimum grade D- (30%) in the pre-requisite courses**
Obtained minimum of 80 credits
Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 4: SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4533	System Design	3	SEMM 3523
SEMM 4912	Undergraduate Project I	2	SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
SEMP 4713	Design for Manufacture and Assembly	3	
SEMP 4723	Manufacturing Automation	3	
SEMP 47x3	Elective I	3	
SEMP 5xx3	PRISMS Elective I		
UXXX 2xx2	Generic Skills or Knowledge Expansion Cluster Elective	2	
	Total	**16**	

YEAR 4: SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4902	Engineering Professional Practice	2	
SEMM 4924	Undergraduate Project II	4	
SEMP 4733	Tooling for Production	3	
SEMP 47x3	Elective 2	3	
SEMP 5xx3	PRISMS Elective 2		
UHLX 1112	Foreign Language Elective	2	
UKQT 3001	Extra-Curricular Experiential Learning	1	Completed 3 extracurricular experience programmes
	Total	**15**	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

* Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

Elective Courses

1.	SEMP 4743	Plastic Technology
2.	SEMP 4753	Non-Traditional Machining
3.	SEMP 4763	Quality Engineering & Metrology
4.	SEMP 4773	Modern Manufacturing
5.	SEMP 4783	Casting Technology
6.	SEMP 4793	Product Design & Manufacture
7.	SEMP 4013	Additive Manufacturing
8.	SEMP 4023	Sustainable Manufacturing
9.	SEMP 4813	Engineering Economy & Accounting
10.	SEMP 4823	Quality Engineering
11.	SEMP 4833	Project Management & Maintenance

PRISMS ELECTIVE COURSES

For students who intend to enroll in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO	COURSE CODE	COURSE NAME	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (/) IF PASSED
MECHANICAL ENGINEERING COURSES					
1	SEMM 1013	Programming for Engineers	3	3	
2	SEMM 1113	Mechanics of Solids I	3	3	
3	SEMM 1203	Statics	3	3	
4	SEMM 1213	Dynamics	3	3	
5	SEMM 1503	Engineering Drawing	3	3	
6	SEMM 1513	Introduction to Design	3	3	
7	SEMM 1911	Experimental Methods	1	1	
8	SEMM 1921	Introduction to Mechanical Engineering	1	1	
9	SEMM 2123	Mechanics of Solids II	3	3	
10	SEMM 2223	Mechanics of Machines & Vibration	3	3	
11	SEMM 2313	Mechanics of Fluids I	3	3	
12	SEMM 2323	Mechanics of Fluids II	3	3	
13	SEMM 2413	Thermodynamics	3	3	
14	SEMM 2433	Applied Thermodynamics & Heat Transfer	3	3	
15	SEMM 2613	Materials Science	3	3	
16	SEMM 2713	Manufacturing Processes	3	3	
17	SEMM 2921	Laboratory I	1	1	
18	SEMM 3023	Applied Numerical Methods	3	3	
19	SEMM 3233	Control Engineering	3	3	
20	SEMM 3242	Instrumentation	2	2	
21	SEMM 3523	Component Design	3	3	
22	SEMM 3623	Materials Engineering	3	3	
23	SEMM 3813	Industrial Engineering	3	3	
24	SEMM 3823	Engineering Management, Safety & Economics	3	3	
25	SEMM 3915	Industrial Training	5	HL	
26	SEMM 3931	Laboratory II	1	1	
27	SEMM 3941	Laboratory III	1	1	
28	SEMM 4533	System Design	3	3	
29	SEMM 4902	Engineering Professional Practice	2	2	
30	SEMM 4912	Undergraduate Project I	2	2	
31	SEMM 4924	Undergraduate Project II	4	4	

32	SEMP 3713	CAD/CAM	3	3	
33	SEMP 4713	Design for Manufacture & Assembly	3	3	
34	SEMP 4723	Manufacturing Automation	3	3	
35	SEMP 4733	Tooling for Production	3	3	
36	SEMP 4xx3	Elective I	3	3	
	SEMP 5xx3	PRISMS Elective I			
37	SEMP 4xx3	Elective II	3	3	
	SEMP 5xx3	PRISMS Elective II			
TOTAL CREDIT FOR MECHANICAL ENGINEERING COURSES (A)			**101**	**96**	
ELECTRICAL COURSES (School of Electrical Engineering)					
1	SEEU 1002	Electrical Technology	2	2	
2	SEEU 2012	Electronics	2	2	
TOTAL CREDIT FOR ELECTRICAL COURSES (B)			**4**	**4**	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
TOTAL CREDIT FOR MATHEMATICS COURSES (C)			**12**	**12**	
UNIVERSITY GENERAL COURSES					
CLUSTER 1: APPRECIATION OF PHILOSOPHY, VALUE & HISTORY					
1	UHIS 1022	Philosophy and Current Issues (for Local Students Only)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students Only)			
2	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
CLUSTER 2: GENERIC SKILLS					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UHMT 2012	Leadership	2	2	
3.	UHMS 2022	Critical and Creative Thinking	2	2	
4.	UHMS 2032	The Human side of Knowledge Management	2	2	
5.	UHMS 2042	Development and Global Issues	2	2	
6.	UHMT 2042	Guidance & Counselling	2	2	
7.	UHMT 2062	Psychology of Adjustment	2	2	

8.	UBSS 2072	Fundamentals of Intellectual Property Law	2	2	
9.	UBSS 2082	Law for Entrepreneurs	2	2	
10.	UBSS 2092	Entrepreneurship and Enterprise Development	2	2	
11.	UBSS 2102	Social Entrepreneurship	2	2	
12.	UHMS 2112	Engineering Communication	2	2	
13.	UHMS 2122	Human Communication	2	2	
14.	UHMT 2132	Professional Ethics	2	2	
15.	UMJT 2142	Professional Ethics, Safety and Health (Ningen Ryoku)	2	2	
CLUSTER 3: KNOWLEDGE EXHANCEMENT					
1.	UHIT 2302	Science and Technology Thinking	2	2	
2.	UHIT 1022	Science, Technology and Mankind	2	2	
3.	UHII 2012	Al-Qur'an and Human Civilization	2	2	
4.	UHIT 2032	Life Institutions and Sustainable Development	2	2	
5.	UHIZ 2042	Future Studies	2	2	
6.	UHIT 2052	Family Law	2	2	
7.	UHIZ 2062	World science	2	2	
8.	UHIS 2072	Sustainable Economy	2	2	
9.	UHIS 2082	Practice and Concept of Halal Management	2	2	
10.	UHII 2092	Philosophy of Islamic Art	2	2	
11.	UHII 2102	Islam and Health	2	2	
12.	UHII 2132	Islamic Entrepreneurship	2	2	
13.	UETS 2142	Sustainable Energy	2	2	
CLUSTER 4: CO-CURRICULUM & SERVICE LEARNING					
1	UKQF xxx2	Co-curriculum & Service-Learning Elective	2	2	
2	UKQT 3001	Extra-Curricular Experiential Learning	1	1	
CLUSTER 5: LANGUAGE SKILLS					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHLB 1032	Introductory Academic English	2	2	
5	UHLB 1042	Intermediate Academic English	2	2	
6	UHLA 1112	Arabic Language	2	2	
7	UHLJ 1112	Japanese Language 1	2	2	
8	UHLC 1112	Mandarin Language I	2	2	

9	UHLF 1112	French Language	2	2	
10	UHLN 1112	Persian Language	2	2	
11	UHLJ 1122	Japanese Language for Communication I	2	2	
12	UHLM 1112	Malay Language for Communication	2	2	
CLUSTER 6: ENTREPRENEURSHIP					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSES (D)			**23**	**23**	
TOTAL CREDIT TO GRADUATE (A + B + C + D)			**140**	**135**	
Note: # Choose one elective either from Cluster 2 (Generic Skills) or Cluster 3 (Knowledge Expansion) for Uxxx 2xx2					
OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATION (PCS) • **Students are required to enrol and pass FIVE (5) PCS courses, in order to be eligible to graduate** • **Please refer to page FE 8 in UG Academic Handbook, for more information about PSC courses.**					
Compulsory PSC Courses (Enrol all 3 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
Elective PSC Courses (Choose 3 only)					
1	GSPX XXXX	Data Analytic for Organization			
2	GSPX XXXX	ISO 9001:2015 Quality Management System Requirement			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	How to Manage Your Personal Finance			

COURSE SYNOPSIS

CORE COURSES

SEMM 1013 - Programming for Engineers

This course formally introduces the concept of computers, algorithms, programming languages, pseudo-code, and design of programs for solution to computational engineering problems. The two programming languages introduced in this course are C and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting and model building.

SEMM 1113 - Mechanics of Solids I

The course provides students with the knowledge to determine the strength and stiffness of engineering structures being used. The structures that will be used in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SEMM 1203 - Statics

This course introduces students to the part of mechanic which is a pre-requisite for most engineering courses including SEMM 1213, SEMM 2313 and SEMM 1113. The course enables student to acquire the essential basic knowledge of resultant and equilibrium of forces. It will examine key elements in producing free body diagrams for particles and rigid bodies, as essential first step in solving applied mechanics problems. Exposure to the conceptof moment and equilibrium equations with reference of Newton's Law enhances the relevanceof friction, trusses, frames and machines applications. Students are also introduced to the concept of distributed forces, which include centroid and centre of gravity and the generated surface area and volume of revolution. Hence, students will be able to demonstrate and applythe knowledge in continuing subjects which requires the analytical skills developed in this subject.

SEMM 1213 - Dynamics

The course is an extension to SEMM 1203, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces energy and power to move a body.

SEMM 1503 - Engineering Drawing

This subject introduces student to the use of technical drawing in an effective way for communicating and integrating with engineering concepts. Such environment will provide a platform where the engineer can share and exchange information. This subject will also enlighten the student on the significant changes in the engineering and technical graphic due to the use of computer and CAD (Computer Aided Design) software. At the end of the course, student should be able to apply the skill and knowledge of engineering drawing to interpret design, using graphics method such as geometric drawing, orthographic projection, isometric, machine drawing, detailed drawing, and basic CAD software.

SEMM 1513 - Introduction to Design

This course is designed to introduce students to the concepts and methods of engineering design process in solving engineering design problems, creatively and effectively. The design process introduces problem background, concept generations and selections, development of selected concept and testing of selected concept by constructing and testing a prototype. This course serves as a preparation for students to proceed to higher level design classes.

SEMM 1911 - Experimental Methods

This course is conducted via lectures and experimental case study data. Students are exposed to the experimental method theory for the initial weeks and then followed by case study data. The lecture contents shall cover the fundamental of experimental method and the basic principles in measurements, instrumentation and analysis of results. It shall focus on the design of mechanical experiments, selection of sensors and transducers, estimation of errors and display of results. It shall also cover the analysis of results and how to prepare proper report writing. Student comprehension will be tested in two written tests. Based on the given experimental data, students are also expected to conduct statistical analysis of results and write the experimental outcome in a report.

SEMM 1921 - Introduction to Mechanical Engineering

This course comprises of two modules intended to introduce students to the field of mechanical engineering. The first module raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of generic skills to engineers. It also provides students with a clear overview of different fields within Mechanical Engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skill required for an engineer entrepreneur. This course introduces students to the field of mechanical engineering. It raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of both technical and generic skills to mechanical engineers. It also provides students with a clear overview of different fields within mechanical engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skills required for an engineering entrepreneur.

SEMM 2123 - Mechanics of Solids II

The course is an extension to SEMM 1113, which is the pre-requisite to this course. It aims to extend the student's knowledge and understanding of the behaviour of materials and structures under a variety of loading conditions. The course starts off with plane stress and plane strain transformation, following which several elastic failures criteria's are investigated. The course provides an opportunity to investigate thick cylinders, structural deformation behaviour by using the energy method, instability problems of struts and elasto-plastic bending of beams. Determinate and indeterminate problems will be examined. At the end of the course, students should be able to calculate and evaluate stress, strain and deformation of structures in torsion and bending. They should also be able to evaluate failure modes and estimate fracture life of structures and components. The aspect of designing safe components and structures shall also be emphasized to the students.

SEMM 2223 - Mechanics of Machines and Vibration

The course requires SEMM 1213 as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines which include belt and pulley systems, gears, flywheels, governors and gyroscopes. Students will also be exposed to the methods of balancing rotating masses and parts of a combustion engine. The concept of vibration with respect to one-degree-freedom is also studied. At the end of the course, the students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

SEMM 2313 - Mechanics of Fluids I

The principle aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behaviour and flow. It will emphasize on the concept of pressure, hydrostatic pressure equation and its application in the measurement of pressure, static force due to immersed surfaces, floatation and buoyancy analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduced especially to solve flow measurement, mass or volumetric flow rate, momentum in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate an ability to analyze whether statically, dynamically or kinematically problems related directly to fluids.

SEMM 2323 - Mechanics of Fluids II

This course is designed to enhance the basic knowledge that has been developed in the first stage of Fluid Mechanics and expose the students in analysing hydrodynamically the flow field. It will emphasize on the analysis and the importance of ideal, boundary layer, and compressible flow in a practical engineering application. The course will also provide the analysis of flow through fluid machines such as pump and turbine. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to flow of fluids.

SEMM 2413 - Thermodynamics

Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle expressed in the First Law of Thermodynamics will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

SEMM 2433 - Applied Thermodynamics & Heat Transfer

This course aims to develop a fundamental understanding of the processes by which heat, and energy are inter-related and converted and by which heat is transferred. The course will review major principles of energy conversion and the modes of heat transfer. The basic laws of thermodynamics and the governing equations for heat transfer and thermodynamics will be introduced and subsequently used to solve practical engineering problems involving thermodynamics and heat transfer. The course will also cover fundamental principles of power generation systems.

SEMM 2613 - Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers and composites and their fundamental structures. The course will also provide basic diffusion mechanisms, metal solidification phase diagrams and heat treatment processes. At the end of the course, students should be able to apply the knowledge of atomic bonding and crystal structures to predict the physical and mechanical behaviour of materials and use the principlesof phase diagrams and heat treatments to the design of materials and their properties.

SEMM 2713 - Manufacturing Processes

This course discusses the fundamental aspect of various traditional and non-traditional manufacturing processes for metal and non-metal components. It starts from the overall introduction on manufacturing aspects followed by polymer shaping processes, casting processes, joining processes, metal forming processes and machining processes including CNC and CAM. At the end of this course, the students should be able to select suitable manufacturing processes to produce a part/product. The knowledge gained from this course also allows students to make right decision in designing products based on process requirements.

SEMM 2921 - Laboratory I

This course is introduced in the second year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It consists of six laboratories; Strengths of Materials Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluid Laboratory. Students will be grouped into 5 to 6 people for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each

experiment and will be evaluated based on this report.

SEMM 3023 - Applied Numerical Methods
This course formally introduces the steps involved in engineering analysis (mathematical modelling, solving the governing equation, and interpretation of the results). Examples of case studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and partial differential equation are introduced.

SEMM 3233 - Control Engineering
The course shall cover the essential and basic theory of control engineering. It shall cover the followings: open and closed-loop systems, manipulation of block diagram, signal flow graph and Mason's rule, concept of transfer function, time response analysis, classification of system, control action, stability analysis, Routh criteria, root locus method, frequency analysis, Nyquist and Bode plots, relative stability from Nyquist and Bode diagrams and design of control system. MATLAB and Simulink software package shall be taught and used as a tool in solving control engineering problems where appropriate.

SEMM 3242 - Instrumentation
The course shall cover the essential and basic theory of instrumentation for undergraduate. It shall cover the following: fundamentals and components of instrumentation system, characteristics of instrumentation system, signal conditioning and application of sensors in measurements.

SEMM 3523 - Components Design
This course is designed to expose students in analysing machine design element failure theories. This includes failure due to static and fatigue loads. It involves fatigue strength and endurance level, modified stress Goodman diagram and fatigue design under tensile and combined stresses. The content will encompass the design and selection of bolts, welding, spring, ball and roller bearing, gears and belts. At the end of the course, students should have the capabilities to identify, analyse and design the machine elements in the perspective of static and fatigue failure aspect.

SEMM 3813 - Industrial Engineering
This course introduces students to various theories, principles and the importance in the area of industrial engineering and project management. It covers issues related to productivity, quality, work study, ergonomics, facilities planning and project scheduling. The contents give some brief exposure on the concept and application of overall discipline for an industrial engineer. Some calculations or measurements are introduced as an approach before deciding the best alternative. Students should be able to describe fundamental aspects of project management and integrate knowledge in engineering and project management. In project management, students are exposed to several steps in developing project plan, managing risks, scheduling resources reducing project duration, and progress and performance measurement. At the end of the course, students should be able to apply various concept and tools in selecting the best alternative in terms of man, machine, materials, method and

management and planning and monitoring engineering projects.

SEMM 3823 - Engineering Management, Safety and Economics
This course aims to prepare students with basic management knowledge, safety and engineering economy. The management part will examine key issues in management and organization, past management and today, strategic management, organizational structure and design, human resource management, motivating employees and leadership. Major topics covered under safety are OSHA 1994, Factories and Machinery Act 1967, hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. In engineering economy, students are exposed to engineering economic principles and methods of engineering economic analysis. At the end of the course, students should be able to describe fundamental aspects of management; integrate knowledge in engineering and management in making business decisions; apply the principles of hazard identification, risk assessment/control; plan, design and implement an effective safety program; and also perform engineering economic analysis to solve problems and evaluate engineering investment/projects.

SEMM 3915 - Industrial Training
Industrial training exposes students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning that requires the students to learn the process and able to apply their knowledge acquired in class in actual industrial setting. The knowledge acquired during practical training may be used later in final year classes as well as to equip them with sufficient knowledge for job interviews.

SEMM 3931 - Laboratory II
This course is introduced in the third year of Mechanical Engineering programme involving two hours per week and experimental based courses. It consists of six laboratories; Strength of Materials Laboratory, Thermodynamics Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluids Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3941 - Laboratory III
This course is introduced in the third year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It is divided into two parts; experimental work at System & Control and Vibration Laboratories and a problem- based-learning (PBL) laboratory (module) depending on the topics/labs facilitated by a lecturer. Students have to produce a short report for the experimental work similar to those in Laboratory I and II. The second part, i.e., the lab module is based on the PBL concept. Student have to plan and design their own experimental work right from the very beginning until the end of the module based on the topics given by the lecturer. Students will be grouped into 5 to 6 for each module. In general, every group have to conduct two experimental works and two modules. At the end of the session, students have to submit two short reports and two

formal reports.

SEMM 4533 - System Design
This course is designed for students to gain detailed topical exposure to design methodologies and principles specific to the practice of mechanical design. Emphasis is on developing efficient and effective design techniques as well as project-oriented skills from both technical and non-technical considerations. At the end of this course, students should be able to identify and apply appropriate methodologies in performing design tasks, recognize the fundamental principles of mechanical designs and practices, formulate and apply general problem-solving strategies in the analysis of situations and potential problems and apply relevant industry standards in design. Student should also be able to communicate ideas and solutions in verbal and written forms by means of oral presentation and technical report.

SEMM 4902 - Engineering Professional Practice
This course introduces students to engineering ethics and an engineer's responsibilities towards safety, health and welfare of the public. It emphasizes on the engineer as a professional man, engineers & society, code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practice. The course will also introduce students to organize, in a group, community service activities in a planned and structured manner. At the end of the course, students should be able to demonstrate and apply engineering professional ethics in their career as an engineer.

SEMM 4912 - Undergraduate Project I
This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given a topic on a project, students have to identify a problem, gather relevant information to the problem and propose solutions to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

SEMM 4924 - Undergraduate Project II
This course is the continuation of Undergraduate Project (UGP) I. It enhances the students' knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and the ability to plan and manage their work effectively. This course will also develop the students' capability to present, discuss and analyse results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

SEMP 3713 - CAD/CAM
This course is designed to provide the fundamental concepts of Computer Aided Design and Manufacture (CAD/CAM) and their underlying mathematical principles. Topics include CAD/CAM architecture, geometric modelling, solid modelling, part programming, CNC fundamentals, data exchange as well as CAD standards. Students will able to incorporate hands-on experience using CAD/CAM software related with drafting, modelling, assembling

activities and additive manufacturing. Furthermore, students will utilize the CAD/CAM knowledge to complete a simple as well as complex design/manufacturing project throughout the course.

SMEP 4713 - Design for Manufacture and Assembly

This course aims to provide students with the necessary concepts and procedures to understand the integration of manufacturing criteria into the product design process. This course will explore Design for Manufacture and Assembly (DFMA) principles for design of reliable and easy-to- produce components having minimal cost. Design of machined, powder metallurgy/particulates and casting parts will be considered, along with design of assemblies. Materials selection and the benefits of DFMA in reduction in part and assembly costs will also be discussed.

SEMP 4723 - Manufacturing Automation

Manufacturing Automation is becoming more important in the near future to many organizations due to increasing global competition to produce products at the competitive price and quality. Knowledge in automation for future engineers is vital for allowing them designing a competitive and productive system. In this course, the students are exposed to various low cost automation control systems that are commonly used in industries such as pneumatic, electro pneumatic, hydraulic, electro hydraulic, electric motor controls and Programmable Logic Control (PLC), including introduction to Robotics and Internet of Things (IoTs). At the end of this course, the students will be able to design a simple control circuit for an automated system.

SEMP 4733 - Tooling for Production

This course gives a brief but overall introduction to various types of production tooling typically used in manufacturing operations with special emphasize on jigs, fixtures, limit gauges and sheet metal press dies. Students are given comprehensive exercises and assignments on the design of jigs, fixtures and various categories of sheet metal stamping operations such as shearing, bending and deep drawing. The course will integrate various previous manufacturing basic knowledge such as manufacturing process, CAD/CAM/CAE, and DFMA.

ELECTIVE COURSES

SEMP 4013 - Additive Manufacturing

This course aims to prepare students with one of the pillar knowledges under industrial 4.0 industrial revolutions. Additive Manufacturing (AM), also known as 3D Printing Technology, is a group of manufacturing technologies that involves part creation by joining material together without part-specific tooling, driven by a computer. The technologies focus on prototypes and low-technology applications, AM service parts are being used in safety-critical fields including aerospace, automotive, biomedical, and services industries. The purpose of this course is to provide participants with knowledge and tools for informed decision making relative to integration of AM processes and parts into the industrial application. The coverage includes current AM practice for metals, polymers and ceramics; mechanical properties; AM processing for production; and application inroads into industrial applications. At the end of the course, students should be able to describe fundamental aspects of Additive Manufacturing/3D

Printing Technology techniques and their application; finally, also perform engineering analysis to solve product manufacture problems and evaluate engineering investment/projects by utilized this technique.

SEMP 4023 - Sustainable Manufacturing
This course introduces students to sustainability considerations in product design and manufacture. It is presenting the principles, methodology and case studies to develop an understanding of sustainable development that can reduce environmental impact and promote sustainable practice. Besides that, it is also introduced the new and innovative concept in sustainable development involving the transformation of 6Rs (reduce, reuse, recycle, recover, redesign, remanufacture) from the traditional 3Rs (reduce, reuse and recycle).

SEMP 4743 - Plastic Technology
This course provides a basic introduction but in-depth coverage of plastic mold design using CAD and CAE software, particularly for designing plastic injection mold. The CAD and simulation software used in the product and process design phases help the students to optimize the mold design. It is hoped that through this exposure the students will be able to further develop their design capability in actual working environment, thereby fill the presently serious gap of local engineering know how in this field.

SEMP 4753 - Non-Traditional Machining
This course introduces students to several methods of non-traditional machining. For each of the processes (ie: electro discharge machining, water jet machining, laser machining etc), it will examine the basic principles involved and machining parameters important to the process, as well as equipment, tooling and application issues. Where appropriate, theoretical or empirical models to estimate process attributes such as material removal rate will be described. Case studies will also be presented.

SEMP 4763 - Quality Engineering and Metrology
Product quality and the proper functioning of processes are among the important issues for any manufacturing and service organization. Manufacturing engineers play an important role in designing and performing experiments and subsequently analyzing the data collected to solve the problems on hand. This course emphasizes on the design and analysis of experiments, an important tool in industry as well as in research organization, for determining the effect of independent variables on the output of a system. In addition to the above, knowledge on measurement techniques is essential for manufacturing engineers. Product quality needs to be measured or inspected using the right techniques and the data collected need to be analysed correctly in order to ensure that decisions regarding production quality are made correctly.

SEMP 4773 - Modern manufacturing
This course introduces automation and advanced techniques used in the modern manufacturing. Types of automation systems, applications, advantages and disadvantages are discussed. It also includes discussion on the principle of CAD/CAM and other applications in various manufacturing automation systems such as GT, CNC, FMS and CIM. This course will also allow students to carry out small case studies in the real environments for exposing

them on certain issues related to manufacturing automation.

SEMP 4783 - Casting Technology
This course is designed to expose student to the primary elements of casting processes when producing a component. It covers in depth various issues in pattern and pattern making, the making of mould for various casting processes primarily the sand-based production, melting, melt treatment and the solidification phenomenon of metal. This course also emphasizes on gating and riser design, design for casting, typical casting defects and the quality control involved during processing and production. At the end of the course the student should be able to appraise the casting knowledge in deciding a suitable casting/moulding process to produce a casting component, estimate the riser requirements through calculation, use casting design principles in redesigning components to be reproduced using casting process, describe issues related to defects, quality control and inspection, gating, melt treatment and solidification.

SEMP 4793 - Product Design and Manufacture
This course introduces the students to the various stages of product design and development methods that can be put into immediate practice in developing products or projects. The development procedures blend the various perspective of marketing, design and manufacturing into a single approach to product development. Aspect of sustainable design and manufacturing will also be covered. The course also provide practice in carrying small project to expose the various stages of product development. It also includes the various prototyping and manufacturing systems strategies in developing product prototype.

SEMP 4813 - Engineering Economy and Accounting
This course is designed to equip students to acquired engineering economy and accounting concepts, principles and methods. The focus of this course is to provide understanding on engineering economic principles and methods and to apply it in engineering field. The course has two parts. Part 1 is designed to teach students to formulate cash-flow, perform analysis on engineering economic problems and evaluate between alternative of engineering investment/projects to make decision. Part 2 is designed to teach students to perform cost estimates using traditional and current costing techniques in production process, prepare simple financial statement and interpret financial performance of business firms for decision and control.

SEMP 4823 - Quality Engineering
This course covers process and product variation, Six Sigma, Quality Function Deployment, Failure Mode Effect Analysis, Gage Repeatability and Reproducibility, Short Run SPC and experimental methods such Taguchi Methods and Classical Experimental Designs. Students are required to work in groups to integrate these tools in solving case studies problems.

SEMP4833 - Project Management and Maintenance
This course is designed to expose students to project management and maintenance. In project management, the course emphasizes the general management of project as well as project scheduling and analysis. General management includes topics such as project manager, project planning, work breakdown structure (WBS) and negotiation and conflict

resolution. Whereas project scheduling addresses topic such as PERT, Critical Path Method (CPM), resource allocation, reducing project duration and project progress and performance measurement. Major topics covered under maintenance are maintenance engineering in general, preventive maintenance, total productive maintenance (TPM), six major losses, measuring overall equipment effectiveness (OEE), reliability and maintenance cost issues. At the end of the course, students should be able to apply knowledge in project management to plan, schedule and control projects as well as to apply basic maintenance concept and develop a total productive maintenance (TPM) program in a company.

BACHELOR OF MECHANICAL ENGINEERING (AERONAUTICS) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Mechanical Engineering (Aeronautics) with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualification and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on course works and final examinations given throughout the semester.

General Information

1.	**Awarding Institution**		Universiti Teknologi Malaysia
2.	**Teaching Institution**		Universiti Teknologi Malaysia
3.	**Programme Name**		Bachelor of Mechanical Engineering (Aeronautics) with Honours
4.	**Final Award**		Bachelor of Mechanical Engineering (Aeronautics) with Honours
5.	**Programme Code**		SEMTH
6.	**Professional or Statutory Body of Accreditation**		Engineering Accreditation Council (EAC)
7.	**Language(s) of Instruction**		Bahasa Melayu and English
8.	**Mode of Study (Conventional, distance learning, etc.)**		Conventional
9.	**Mode of Operation (Franchise, self-govern, etc.)**		Self-govern
10.	**Study Scheme (Full Time / Part Time)**		Full Time
11.	**Study Duration**		Minimum : 4 years Maximum : 6 years
Type of Semester		No of Semesters	No of Weeks/Semester
Normal		8	14
Short		1	8
12.	**Entry Requirements**		Matriculation / STPM / Diploma or equivalent

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (q) General (r) Language (s) Entrepreneurship (t) Co-Curriculum	 10 8 2 3	16.4%
ii.	Programme Core	87	62.2%
iii.	Programme Electives	30	21.4%
	Total	**140**	**100%**
Classification of courses for engineering programme			
A	Engineering Courses (q) Lecture/Project/ Laboratory (r) Workshop/Field/Design Studio (s) Industrial Training (t) Final Year Project	 94 0 5 6	75%
	Total Credit Hours for Part A	**105**	
B	Non-Engineering (q) Applied Science/Mathematic/Computer (r) Management/Law/Humanities/Ethics/Economy (s) Language (t) Co-Curriculum	 12 12 8 3	25%
	Total Credit Hours for Part B	**35**	
Total credit hours for Part A and B		**140**	**100%**
Total Credit Hours to Graduate		**140 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 140 credit hours with a minimum CGPA of 2.00.
- Has passed all specified courses.
- Has applied for graduation and has been approved by the University.
- Has completed all five (5) Professional Skills Certification (PSC) courses in UTM
- Other condition as specified.

AREAS OF STUDY

Aeronautical engineering encompasses all aspects of studies related to flying. In this aspect, flying includes aerospace flight. The areas of specialisation in Aeronautical Engineering can be divided into the following: -

(a) Aerodynamics

Aerodynamics is the relationship between air (wind) and the material (solid) that moves in it. Various principles of Fluid Mechanics are considered in a flying problem. For example, aerodynamic study will determine a suitable shape for an aircraft, missile etc.

(b) Aircraft structure

This area will determine the integrity (strength) of a flying body such as an aircraft or a missile. Using dimensions and tolerances, strength of material, shear flow and theory of thin plate, the structure of an aircraft can be determined.

(c) Aircraft propulsion

Propulsion is a study of an aircraft powerplant. This study includes design and selection of appropriate power plant for a particular aircraft. This field has developed vastly since the increase in the cost of petroleum. Engineer shave been competing to invent lighter and more economic power plants.

(d) Aircraft instrumentation and Avionics

Avionics is the acronym for `Aviation Electronics' and together with aircraft instrumentation they involve a wide range of studies. Flying has been facilitated by the use of various electronic devices. Electronic devices, which facilitate flying such as radars ILS (Instrument Landing System) ADF (Automatic Direction Finder) etc., were specifically invented by the Avionic/Aircraft Instrument Engineer. The Avionic/Aircraft Instrument Engineer will have to ensure that the instrument fitted on an aircraft will function satisfactorily together with a high degree of reliability.

(e) Management

The aircraft industry has expanded tremendously during this decade. The industry requires experts to manage and administer its operation smoothly. Regulations concerning the construction and operations of aircraft have been so devised in order to avoid accidents and mistakes which may sacrifice lives.

(f) Transportation

Apart from transporting passengers an aircraft is also used as cargo carriers, ambulance etc. Study in this area trains transportation experts to modify flight schedule and load so that the aircraft can be used economically.

(g) Flight Regulations

To avoid accidents the flying fraternity has formulated special laws for flying. Briefly the laws are divided into two, namely military flight regulations and public flight regulations.

(h) Materials for Aircraft

This field focuses its study on selecting and determining metals, plastic, composites, etc. which are suitable for building an aircraft, rocket etc.

(i) Flight Mechanics

Flight mechanics is an important aspect in the design and operation of an aircraft flight mission. Research area includes aircraft performance (take-off, climbing, cruising, decent and landing) and aircraft static stability and control in steady flight condition.

(j) Flight Dynamics and Control

The area is about the dynamics behaviour of rigid body aircraft and the application of control system theory to design simple stability augmentation systems to more complex automatic flight control systems. This includes the application of modern multivariable control system design using state-space methods. The area includes the equation of motion of rigid body including translation aircraft longitude in a land lateral dynamic stability, flying and handling qualities, stability augmentation and automatic flight control system, aerodynamics stability derivatives and multivariable state-space methods.

CAREER PROSPECTS

Graduates of this programme are essentially Mechanical Engineers but those with specialisation to Aeronautical Engineering can easily find job opportunities in various sectors. Alternatively, they can also be known as Aeronautical Engineers depending on their job placements in industries, they are in.

The Aeronautical Engineering programme at UTM is offered as a specialisation of mechanical engineering and covers five main areas namely aerodynamics, aircraft Structure, flight dynamics and control, propulsion and aircraft design. Thus, graduates of this programme satisfy the requirement to graduate as an engineer in Mechanical Engineering as well as in the field of specialisation in aeronautics. Apart from TUDM, the Civil Aviation Department requires trained manpower to supervise flying activities in Malaysia. Other organisations that require graduates in the field of aeronautics include Malaysia Airline System, AirAsia, AIROD, Eagle Aircraft, SME Aviation, Malaysia Helicopter Services (MHS), TLDM and PDRM Air Unit. Several other firms also have working opportunities in the airline industry.

In the field of academic and research opportunities is available for Aeronautical Engineers to serve in any institution that runs courses and research in the field of Aeronautics. Several other universities and institutions in Malaysia have started to offer programme in the field of Aeronautics too. Due to the rapid expansion in the airline industry, many airline companies, flying clubs and firms are prepared to get involved actively in the airline industry of the country by offering more job opportunities to UTM graduates.

MOBILITY PROGRAMME (OUTBOUND)

Universiti Teknologi Malaysia (UTM) is offering five (5) types of mobility programs which allow UTM Student to go abroad and join academic programs in universities, institutions or organizations in all over the world. The opportunities offered are as below:

1. Study Abroad / Student Exchange

Study Abroad/Student Exchange programme is a programme which allow student to spend one or two semesters at universities abroad and take courses in regular semester with credit transfer opportunity.

2. Research Internship Abroad

Research Internship is a program which allow student to join research study or internship under the supervision of an academic staff at universities or industries abroad from all over the world.

3. Global Outreach Programme (GOP)

GOP is a 7 to 14 days academic based program to experience various cultures in other countries. It includes immersion elements such as research & academic activities, social responsibility and cross-cultural activities.

4. International Invitation Programme

Students participate in program organised by international institutions/ organisations with the following themes:

(i) Seminar, Conference or Paper Presentation
(ii) Cultural Exhibition and Conference
(iii) Student Development Activity

5. Summer School Abroad

Summer School program is a program which is designed to provide educational opportunities in 4 to 8 weeks during summer holiday abroad. It is related to environment, local community, heritage and tradition.

Details and appropriate forms and procedures can be reached at **UTM International link: http://www.utm.my/international/outbound-mobility-programs/**

COURSE MENU

YEAR 1 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1203	Static*	3	
SEMM 1503	Engineering Drawing	3	
SEMM 1911	Experimental Methods	1	
SEMM 1921	Introduction to Mechanical Engineering	1	
SEEU 1002	Electrical Technology	2	
SSCE 1693	Engineering Mathematics I	3	
UHLB 1112	English Communication Skills	2	
UHIS 1022	Philosophy and Current Issues (for Local Student Only)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilisations (for International Students Only)		
	Total	**17**	

YEAR 1 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1013	Programming for Engineers	3	
SEMM 1113	Mechanics of Solids I*	3	SEMM 1203
SEMM 1213	Dynamics*	3	SEMM 1203
SEMM 1513	Introduction to Design	3	SEMM 1503
UHMS 1182	Appreciation of Ethics and Civilisations (for Local Students Only)	2	
UHLM 1012	Malay Language for Communication 2 (for International Students Only)	2	
UHMT 1012	Graduate Success Attributes	2	
	Total	**16**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 2 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2123	Mechanics of Solids II*	3	SEMM 1113
SEMM 2313	Mechanics of Fluids I*	3	SEMM 1203, SEMM 1013**
SEMM 2413	Thermodynamics*	3	
SEMM 2921	Laboratory I	1	SEMM 1911

SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UHIT 2302	Thinking of Science and Technology	2	
UHLB 2122	Academic Communication Skills	2	UHLB 1122
	Total	**17**	

YEAR 2 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2223	Mechanics of Machines & Vibration*	3	SEMM 1213
SEMM 2323	Mechanics of Fluids II*	3	SEMM 2313
SEMM 2433	Applied Thermodynamics and Heat Transfer*	3	SEMM 2413
SEMM 2613	Materials Science	3	
SSCE 2193	Engineering Statistics	3	
SSCE 1793	Differential Equations	3	SSCE 1693
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 3 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2713	Manufacturing Processes	3	
SEMM 3023	Applied Numerical Methods	3	SEMM 1013, SSCE 1793
SEMM 3233	Control Engineering	3	SEMM 1213**, SSCE 1793**
SEMM 3622	Material Technology	2	SEMM 2613
SEMM 3931	Laboratory II	1	SEMM 2921
SEMT 3333	Aerodynamics	3	SEMM 2323**
UBSS 1032	Introduction to Entrepreneurship	2	
	Total	**17**	

YEAR 3 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3033	Finite Element Methods	3	SEMM 1113**
SEMM 3941	Laboratory III	1	SEMM 3931
SEMT 3132	Aircraft Structure I	2	SEMM 2123*
SEMT 3212	Flight Mechanics	2	SEMT 3333**
SEMT 3423	Aircraft Propulsion System	3	SEMM 2413
SEMT 3822	Aviation Management	2	
SEEU2012	Electronics	2	SEEU 1002
UHLB 3132	Professional Communication Skills	2	UHLB 2122
	Total	**17**	

SHORT SEMESTER			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3915	Industrial Training	5	##, SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
	Total	**5**	

Subject to changes
**** Minimum grade D- (30%) in the pre-requisite courses**
Obtained minimum of 80 credits
Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 4 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4912	Undergraduate Project I	2	SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
SEMT 4253	Aircraft Instrumentation and Avionics	3	SEEU2012
SEMT 4223	Flight Dynamics & Control	3	SEMT 3212**, SEMM 3233, SKMF3333
SEMT 4513	Aircraft Design I	3	SEMM 1513, SEMT 3212
SEMT 4143	Aircraft Structure II	3	SEMT 3132
UKQF 2xx2	Co-curriculum and Service-Learning Elective	2	
	Total	**16**	

YEAR 4 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4924	Undergraduate Project II	4	SEMM 4912
SEMM 4902	Engineering Professional Practice	2	Must be 3rd year
SEMT 4523	Aircraft Design II	3	SEMT 4513, SEMT 4143**
SEMT 4813	Aviation Economy	3	
UXXX 2xx2	Generic Skills or Knowledge Expansion Cluster Elective	2	
UHLX 1112	Foreign Language Elective	2	
UKQT 3001	Extra-curricular experiential Learning	1	Completed 3 extracurricular experience programmes

	Total	**17**	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

* Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO	COURSE CODE	COURSE NAME	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (/) IF PASSED
MECHANICAL ENGINEERING COURSES					
1	SEMM 1013	Programming for Engineers	3	3	
2	SEMM 1113	Mechanics of Solids I	3	3	
3	SEMM 1203	Statics	3	3	
4	SEMM 1213	Dynamics	3	3	
5	SEMM 1503	Engineering Drawing	3	3	
6	SEMM 1513	Introduction to Design	3	3	
7	SEMM 1911	Experimental Methods	1	1	
8	SEMM 1921	Introduction to Mechanical Engineering	1	1	
9	SEMM 2123	Mechanics of Solids II	3	3	
10	SEMM 2223	Mechanics of Machines & Vibration	3	3	
11	SEMM 2313	Mechanics of Fluids I	3	3	
12	SEMM 2323	Mechanics of Fluids II	3	3	
13	SEMM 2413	Thermodynamics	3	3	
14	SEMM 2433	Applied Thermodynamics & Heat Transfer	3	3	
15	SEMM 2613	Materials Science	3	3	
16	SEMM 2713	Manufacturing Processes	3	3	
17	SEMM 2921	Laboratory I	1	1	
18	SEMM 3023	Applied Numerical Methods	3	3	
19	SEMM 3033	Finite Element Methods	3	3	
20	SEMM 3233	Control Engineering	3	3	
21	SEMM 3622	Materials Technology	3	3	
22	SEMM 3915	Industrial Training	5	HL	
23	SEMM 3931	Laboratory II	1	1	
24	SEMM 3941	Laboratory III	1	1	
25	SEMM 4902	Engineering Professional Practice	2	2	
26	SEMM 4912	Undergraduate Project I	2	2	
27	SEMM 4924	Undergraduate Project II	4	4	
28	SEMT 3132	Aircraft Structure I	2	2	
29	SEMT 3212	Flight Mechanics	2	2	
30	SEMT 3333	Aerodynamics	3	3	
31	SEMT 3423	Aircraft Propulsion System	3	3	
32	SEMT 3822	Aviation Management	2	2	

33	SEMT 4143	Aircraft Structure II	3	3	
34	SEMT 4223	Flight Dynamics & Control	3	3	
35	SEMT 4253	Aircraft Instrumentation & Avionics	3	3	
36	SEMT 4513	Aircraft Design I	3	3	
37	SEMT 4523	Aircraft Design II	3	3	
38	SEMT 4813	Aviation Economy	3	3	
TOTAL CREDIT FOR MECHANICAL ENGINEERING COURSES (A)			**101**	**96**	
ELECTRICAL COURSES (School of Electrical Engineering)					
1	SEEU 1002	Electrical Technology	2	2	
2	SEEU 2012	Electronics	2	2	
TOTAL CREDIT FOR ELECTRICAL COURSES (B)			**4**	**4**	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
TOTAL CREDIT FOR MATHEMATICS COURSES (C)			**12**	**12**	
UNIVERSITY GENERAL COURSES					
CLUSTER 1: APPRECIATION OF PHILOSOPHY, VALUE & HISTORY					
1	UHIS 1022	Philosophy and Current Issues (for Local Students Only)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students Only)			
2	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
CLUSTER 2: GENERIC SKILLS					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UHMT 2012	Leadership	2	2	
3.	UHMS 2022	Critical and Creative Thinking	2	2	
4.	UHMS 2032	The Human side of Knowledge Management	2	2	
5.	UHMS 2042	Development and Global Issues	2	2	
6.	UHMT 2042	Guidance & Counselling	2	2	
7.	UHMT 2062	Psychology of Adjustment	2	2	
8.	UBSS 2072	Fundamentals of Intellectual	2	2	

		Property Law			
9.	UBSS 2082	Law for Entrepreneurs	2	2	
10.	UBSS 2092	Entrepreneurship and Enterprise Development	2	2	
11.	UBSS 2102	Social Entrepreneurship	2	2	
12.	UHMS 2112	Engineering Communication	2	2	
13.	UHMS 2122	Human Communication	2	2	
14.	UHMT 2132	Professional Ethics	2	2	
15.	UMJT 2142	Professional Ethics, Safety and Health (Ningen Ryoku)	2	2	
CLUSTER 3: KNOWLEDGE EXHANCEMENT					
1.	UHIT 2302	Science and Technology Thinking	2	2	
2.	UHIT 1022	Science, Technology and Mankind	2	2	
3.	UHII 2012	Al-Qur'an and Human Civilization	2	2	
4.	UHIT 2032	Life Institutions and Sustainable Development	2	2	
5.	UHIZ 2042	Future Studies	2	2	
6.	UHIT 2052	Family Law	2	2	
7.	UHIZ 2062	World Scinece	2	2	
8.	UHIS 2072	Sustainable Economy	2	2	
9.	UHIS 2082	Practice and Concept of Halal Management	2	2	
10.	UHII 2092	Philosophy of Islamic Art	2	2	
11.	UHII 2102	Islam and Health	2	2	
12.	UHII 2132	Islamic Entrepreneurship	2	2	
13.	UETS 2142	Sustainable Energy	2	2	
CLUSTER 4: CO-CURRICULUM & SERVICE LEARNING					
1	UKQX xxx2	Co-curriculum & Service-Learning Elective	2	2	
2	UKQE 3001	Extra-Curricular Experiential Learning	1	1	
CLUSTER 5: LANGUAGE SKILLS					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHLB 1032	Introductory Academic English	2	2	
5	UHLB 1042	Intermediate Academic English	2	2	
6	UHLA 1112	Arabic Language	2	2	
7	UHLJ 1112	Japanese Language 1	2	2	
8	UHLC 1112	Mandarin Language I	2	2	
9	UHLF 1112	French Language	2	2	

10	UHLN 1112	Persian Language	2	2	
11	UHLJ 1122	Japanese Language for Communication I	2	2	
12	UHLM 1112	Malay Language for Communication	2	2	
CLUSTER 6: ENTREPRENEURSHIP					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSES (D)			**23**	**23**	
TOTAL CREDIT TO GRADUATE (A + B + C + D)			**140**	**135**	
Note: # Choose one elective either from Cluster 2 (Generic Skills) or Cluster 3 (Knowledge Expansion) for UxxX 2xx2					
OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATION (PCS) • **Students are required to enrol and pass FIVE (5) PCS courses, in order to be eligible to graduate** • **Please refer to page FE 8 in UG Academic Handbook, for more information about PSC courses.**					
Compulsory PSC Courses (Enrol all 3 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
Elective PSC Courses (Choose 3 only)					
1	GSPX XXXX	Data Analytic for Organization			
2	GSPX XXXX	ISO 9001:2015 Quality Management System Requirement			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	How to Manage Your Personal Finance			

COURSE SYNOPSIS

CORE COURSES

SEMM 1013 - Programming for Engineers

This course formally introduces the concept of computers, algorithms, programming languages, pseudo-code, and design of programs for solution to computational engineering problems. The two programming languages introduced in this course are C and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting and model building.

SEMM 1113 - Mechanics of Solids I

The course provides students with the knowledge to determine the strength and stiffness of engineering structures being used. The structures that will be used in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SEMM 1203 - Statics

This course introduces students to the part of mechanic which is a pre-requisite for most engineering courses including SEMM 1213, SEMM 2313 and SEMM 1113. The course enables student to acquire the essential basic knowledge of resultant and equilibrium of forces. It will examine key elements in producing free body diagrams for particles and rigid bodies, as essential first step in solving applied mechanics problems. Exposure to the conceptof moment and equilibrium equations with reference of Newton's Law enhances the relevanceof friction, trusses, frames and machines applications. Students are also introduced to the concept of distributed forces, which include centroid and centre of gravity and the generated surface area and volume of revolution. Hence, students will be able to demonstrate and applythe knowledge in continuing subjects which requires the analytical skills developed in this subject.

SEMM 1213 - Dynamics

The course is an extension to SEMM 1203, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces energy and power to move a body.

SEMM 1503 - Engineering Drawing

This subject introduces student to the use of technical drawing in an effective way for communicating and integrating with engineering concepts. Such environment will provide a platform where the engineer can share and exchange information. This subject will also enlighten the student on the significant changes in the engineering and technical graphic due to the use of computer and CAD (Computer Aided Design) software. At the end of the course, student should be able to apply the skill and knowledge of engineering drawing to interpret design, using graphics method such as geometric drawing, orthographic projection, isometric, machine drawing, detailed drawing, and basic CAD software.

SEMM 1513 - Introduction to Design

This course is designed to introduce students to the concepts and methods of engineering design process in solving engineering design problems, creatively and effectively. The design process introduces problem background, concept generations and selections, development of selected concept and testing of selected concept by constructing and testing a prototype. This course serves as a preparation for students to proceed to higher level design classes.

SEMM 1911 - Experimental Methods

This course is conducted via lectures and experimental case study data. Students are exposed to the experimental method theory for the initial weeks and then followed by case study data. The lecture contents shall cover the fundamental of experimental method and the basic principles in measurements, instrumentation and analysis of results. It shall focus on the design of mechanical experiments, selection of sensors and transducers, estimation of errors and display of results. It shall also cover the analysis of results and how to prepare proper report writing. Student comprehension will be tested in two written tests. Based on the given experimental data, students are also expected to conduct statistical analysis of results and write the experimental outcome in a report.

SEMM 1921 - Introduction to Mechanical Engineering Profession

This course comprises of two modules intended to introduce students to the field of mechanical engineering. The first module raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of generic skills to engineers. It also provides students with a clear overview of different fields within Mechanical Engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skill required for an engineer entrepreneur. This course introduces students to the field of mechanical engineering. It raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of both technical and generic skills to mechanical engineers. It also provides students with a clear overview of different fields within mechanical engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skills required for an engineering entrepreneur.

SEMM 2123 - Mechanics of Solids II

The course is an extension to SEMM 1113, which is the pre-requisite to this course. It aims to extend the student's knowledge and understanding of the behaviour of materials and structures under a variety of loading conditions. The course starts off with plane stress and plane strain transformation, following which several elastic failures criteria are investigated. The course provides an opportunity to investigate thick cylinders, structural deformation behaviour by using the energy method, instability problems of struts and elasto-plastic bending of beams. Determinate and indeterminate problems will be examined. At the end of the course, students should be able to calculate and evaluate stress, strain and deformation of structures in torsion and bending. They should also be able to evaluate failure modes and estimate fracture life of structures and components. The aspect of designing safe components and structures shall also be emphasized to the students.

SEMM 2223 - Mechanics of Machines and Vibration

The course requires SEMM 1213 as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines which include belt and pulley systems, gears, flywheels, governors and gyroscopes. Students will also be exposed to the methods of balancing rotating masses and parts of a combustion engine. The concept of vibration with respect to one-degree-freedom is also studied. At the end of the course, the students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

SEMM 2313 - Mechanics of Fluids I

The principle aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behaviour and flow. It will emphasize on the concept of pressure, hydrostatic pressure equation and its application in the measurement of pressure, static force due to immersed surfaces, floatation and buoyancy analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduce specially to solve flow measurement, mass or volumetric flow rate, momentum in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate an ability to analyse whether statically, dynamically or kinematically problems related directly to fluids.

SEMM 2323 - Mechanics of Fluids II

This course is designed to enhance the basic knowledge that has been developed in the first stage of Fluid Mechanics and expose the students in analysing hydrodynamically the flow field. It will emphasize on the analysis and the importance of ideal, boundary layer, and compressible flow in a practical engineering application. The course will also provide the analysis of flow through fluid machines such as pump and turbine. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to flow of fluids.

SEMM 2413 - Thermodynamics

Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle expressed in the First Law of Thermodynamics will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

SEMM 2433 - Applied Thermodynamics & Heat Transfer

This course aims to develop a fundamental understanding of the processes by which heat, and energy are inter-related and converted and by which heat is transferred. The course will review major principles of energy conversion and the modes of heat transfer. The basic laws of thermodynamics and the governing equations for heat transfer and thermodynamics will be introduced and subsequently used to solve practical engineering problems involving thermodynamics and heat transfer. The course will also cover fundamental principles of power generation systems.

SEMM 2613 - Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers and composites and their fundamental structures. The course will also provide basic diffusion mechanisms, metal solidification phase diagrams and heat treatment processes. At the end of the course, students should be able to apply the knowledge of atomic bonding and crystal structures to predict the physical and mechanical behaviour of materials and use the principlesof phase diagrams and heat treatments to the design of materials and their properties.

SEMM 2713 - Manufacturing Processes

This course discusses the fundamental aspect of various traditional and non-traditional manufacturing processes for metal and non-metal components. It starts from the overall introduction on manufacturing aspects followed by polymer shaping processes, casting processes, joining processes, metal forming processes and machining processes including CNC and CAM. At the end of this course, the students should be able to select suitable manufacturing processes to produce a part/product. The knowledge gained from this course also allows students to make right decision in designing products based on process requirements.

SEMM 2921 - Laboratory I

This course is introduced in the second year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It consists of six laboratories; Strengths of Materials Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluid Laboratory. Students will be grouped into 5 to 6 people for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each

experiment and will be evaluated based on this report.

SEMM 3023 - Applied Numerical Methods

This course formally introduces the steps involved in engineering analysis (mathematical modelling, solving the governing equation, and interpretation of the results). Examples of case studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and partial differential equation are introduced.

SEMM 3033 - Finite Element Methods

This course gives students an exposure to the theoretical basis of the finite element method and its implementation principles and introduces the use of general-purpose finite element software for solving real-life engineering problems.

SEMM 3233 - Control Engineering

The course shall cover the essential and basic theory of control engineering. It shall cover the followings: open and closed-loop systems, manipulation of block diagram, signal flow graph and *Mason*'s rule, concept of transfer function, time response analysis, classification of system, control action, stability analysis, *Routh* criteria, root locus method, frequency analysis, *Nyquist* and *Bode* plots, relative stability from *Nyquist* and *Bode* diagrams and design of control system. MATLAB and Simulink software package shall be taught and used as a tool in solving control engineering problems where appropriate.

SEMM 3622 - Materials Technology

This course introduces students to the basic concepts required to understand and describe the mechanical behaviour and failure mechanism of metals. It will emphasise on the concept of stress intensity factor and fracture mechanics to predict failure of materials and provide understanding on conditions under which fatigue, and creep occur. The course will also introduce students to the theory of electromechanical corrosion in metallic materials, estimate the corrosion rate and understand the methods to control and manage corrosion. By the end of the course, students should be able to apply the criteria of failure to the design of materials and conduct failure analysis of engineering components. This course also covers the properties, processing and applications of non-metallic materials mainly polymer, ceramic and composite.

SEMM 3915 - Industrial Training

Industrial training exposes students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning that requires the students to learn the process and able to apply their knowledge acquired in class in actual industrial setting. The knowledge acquired during practical training may be used later in final year classes as well as to equip them with sufficient knowledge for job interviews.

SEMM 3931 - Laboratory II

This course is introduced in the third year of Mechanical Engineering programme involving two hours per week and experimental based courses. It consists of six laboratories; Strength of Materials Laboratory, Thermodynamics Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluids Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3941 - Laboratory III

This course is introduced in the third year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It is divided into two parts; experimental work at System & Control and Vibration Laboratories and a problem- based-learning (PBL) laboratory (module) depending on the topics/labs facilitated by a lecturer. Students have to produce a short report for the experimental work similar to those in Laboratory I and II. The second part, i.e., the lab module is based on the PBL concept. Students have to plan and design their own experimental work right from the very beginning until the end of the module based on the topics given by the lecturer. Students will be grouped into 5 to 6 for each module. In general, every group have to conduct two experimental works and two modules. At the end of the session, students have to submit two short reports and two formal reports.

SEMM 4902 - Engineering Professional Practice

This course introduces students to engineering ethics and an engineer's responsibilities towards safety, health and welfare of the public. It emphasizes on the engineer as a professional man, engineers & society, code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practice. The course will also introduce students to organize, in a group, a community service activity in a planned and structured manner. At the end of the course, students should be able to demonstrate and apply engineering professional ethics in their career as an engineer.

SEMM 4912 - Undergraduate Project I

This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given a topic on a project, students have to identify a problem, gather relevant information to the problem and propose solutions to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

SEMM 4924 - Undergraduate Project II

This course is the continuation of Undergraduate Project (UGP). It enhances the students' knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and the ability

to plan and manage their work effectively. This course will also develop the students' capability to present, discuss and analyse results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

ELECTIVE COURSES

SEMT 3132 - Aircraft Structures I

The course will give the student an introduction to the various types of structural components used in aircraft, together with their functions and stress calculations under different types of loading. The lectures will include qualitative descriptions of methods of fabrication and provide a thorough introduction to quantitative methods of analysis. The first section covers the analysis of the statically determinate and indeterminate structure including the various type of truss analysis. Next section covers the analysis of the opened, closed and thin wall beam structure peculiar to aircraft, features discussion on the effect of the various types of load exerted and an introduction to structural idealization. Finally, this section also investigates the stress analysis of the multi-cell structures due to the acting loads and its design characteristics. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems of aircraft structures.

SEMT 3212 - Flight Mechanics

Flight mechanics is an important aspect in the design and operation of an aircraft. A flight mission can only be operated successfully and safely if proper efforts are given to this aspect. Therefore, in this course students will be equipped with the fundamental concept of aircraft performance calculation and static stability determination needed to analyse and design modern aircraft. Proper due shall be given to both aspects of performance and static stability. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in flight mechanics and industrial visit of related industries.

SEMT 3333 - Aerodynamics

The course gives an introduction to aerodynamics with specific emphasis to aircraft aerodynamics. The purpose is to instil understanding of the principle of aerodynamics and to provide foundation of fundamental aerodynamics analysis. The contents include: Fluid flow equations (Continuity equation, Euler and Navier Stokes equations); Inviscid flow theory and Joukowski transformation; 2D aerofoil theory (Vortex law, Biot-Savart law, thin aerofoil theory, Fourier theory, thick and cambered aerofoil); Finite wing theory (Vortex system and horseshoe vortex, downwash and lift distribution); Viscous Flow Theory and Boundary Layer; Introduction to industrial aerodynamics (vehicles and buildings).It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems of aerodynamics.

SEMT 3423 - Aerospace Propulsion System

An introduction to aircraft propulsion system including the historical background, review of thermodynamics and fluid mechanics; fundamental of gas dynamics; piston engines; shaft and thrust power; cycle analysis: air standard and cycle with friction; turbojet engine cycle; turbofan engine cycle; gas turbine engine components and their functions; compressor and turbine

velocity diagram analysis; turbine blades cooling techniques; gas turbine emissions; chemical rocket engines. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems of aircraft propulsion system.

SEMT 3822 – Aviation Management
This course covers basic management concepts such as Planning, Organizing, Leading and Controlling; Management of the aviation industry; the process of airworthiness; airport operations; aviation organizations and rules; safety, liability and security in aviation industries; main activities of the aircraft manufacturer, main activities of the airline industry. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in aviation and industrial visit of related industries.

SEMT 4143 - Aircraft Structures II
This course gives students an understanding of the basic principles in the analysis of aircraft structural components and the determination of their strengths under the various operational loading conditions. It covers the areas of thin plate analysis, analysis of structural instability, introduction to the analysis of unidirectional composites, introduction to aeroelasticity and fatigue of aircraft structures. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems of aircraft structures.

SEMT 4223 - Flight Dynamics and Control
This course is about the dynamics behaviour of rigid body aircraft and the application of control system theory to design simple stability augmentation systems to more complex automatic flight control systems. This includes the application of modern multivariable control system design using state-space methods. Topics include axes system and notation, equation of motion of rigid body including translation, aircraft longitudinal and lateral dynamic stability, flying and handling qualities, stability augmentation and automatic flight control system, aerodynamics stability derivatives and multivariable state-space methods. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in aircraft dynamics and control, which also comprising The Fourth Industrial Revolution (*IR 4.0*) element.

SEMT 4253 - Aircraft Instrumentation and Avionics
Aircraft Instrumentation and Avionics course provides the understanding of various basic instrument and electronics used in aircraft. The major topics cover includes an introduction to instrumentation system, component of instrumentation, air data, calibration equations, gyroscopes, indicators, signal conditioning, data acquisition system, transducers, Introduction to avionics, GPS application. The devices that will be thought are such as ADF, VOR, DME, LORAN C, ILS, RADAR Altimeter, GPS, and Primary RADAR. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in aircraft instrumentation and avionics, which also comprising The Fourth Industrial Revolution (*IR 4.0*) element.

SEMT 4513 - Aircraft Design I

The course will allow students to learn methodology and decision making in aircraft design process. This Integrated Design Project (IDP) offers a distinctive opportunity to use knowledge and skill from previous studies in aeronautics class to conduct a practical aircraft design project. Contents of learning include feasibility study, aircraft aerodynamics, aircraft performance & stability and component design.

SEMT 4523 - Aircraft Design II

This course gives students an exposure to the aircraft design process and methodology. Students are split into several groups to carry out aircraft components design and analyses. The progress of this Integrated Design Project (IDP) is closely monitored by the lecturers. Lectures are given to provide the student with information and guidance as project goes along. Group presentation and feedback from lecturers are regularly arranged for student evaluation and design improvement.

SEMT 4813 - Aviation Economy

This course aims to expose Aeronautical engineering students with fundamental elements of economics commonly used in engineering and aviation. The course begins by introducing key economic concepts such as the cash flow diagram and factors in engineering economy. These fundamental concepts are applied on various decision-making tools such as Net Present Value, Future Worth, Annual Worth, Rate of Return and Benefit/Cost Analysis to solve aviation economics related problems. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in aviation and industrial visit of related industries.

BACHELOR OF MECHANICAL ENGINEERING (AUTOMOTIVE) WITH HONOURS

PROGRAMME SPECIFICATION

The Bachelor of Mechanical Engineering (Automotive) with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualification and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on course works and final examinations given throughout the semester.

General Information

1.	**Awarding Institution**		Universiti Teknologi Malaysia
2.	**Teaching Institution**		Universiti Teknologi Malaysia
3.	**Programme Name**		Bachelor of Mechanical Engineering (Automotive) with Honours
4.	**Final Award**		Bachelor of Mechanical Engineering (Automotive) with Honours
5.	**Programme Code**		SEMVH
6.	**Professional or Statutory Body of Accreditation**		Engineering Accreditation Council (EAC)
7.	**Language(s) of Instruction**		Bahasa Melayu and English
8.	**Mode of Study (Conventional, distance learning, etc.)**		Conventional
9.	**Mode of Operation (Franchise, self-govern, etc.)**		Self-govern
10.	**Study Scheme (Full Time / Part Time)**		Full Time
11.	**Study Duration**		Minimum : 4 years Maximum : 6 years
Type of Semester		No of Semesters	No of Weeks/Semester
Normal		8	14
Short		1	8
12.	**Entry Requirements**		Matriculation / STPM / Diploma or equivalent

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (u) General (v) Language (w) Entrepreneurship (x) Co-Curriculum	 10 8 2 3	16.4%
ii.	Programme Core	96	68.6%
iii.	Programme Electives	21	15.0%
	Total	**140**	**100%**
Classification of courses for engineering programme			
A	Engineering Courses (u) Lecture/Project/ Laboratory (v) Workshop/Field/Design Studio (w) Industrial Training (x) Final Year Project	 94 0 5 6	75%
	Total Credit Hours for Part A	**105**	
B	Non-Engineering (u) Applied Science/Mathematic/Computer (v) Management/Law/Humanities/Ethics/Economy (w) Language (x) Co-Curriculum	 12 12 8 3	25%
	Total Credit Hours for Part B	**35**	
Total credit hours for Part A and B		**140**	**100%**

AWARD REQUIREMENTS

To graduate, students must:

- Attain a total of not less than 140 credit hours with a minimum CGPA of 2.00.
- Has passed all specified courses.
- Has applied for graduation and has been approved by the University.
- Has completed all five (5) Professional Skills Certification (PCS) courses in UTM
- Other condition as specified.

AREAS OF STUDY

Students pursuing minor specialization in automotive will take specific automotive related courses in their 3rd and 4th year of the programme. The area of minor specialization will include:

(a) Automotive Technology

This area of study covers the fundamental technical know-how of the automotive main system and sub-systems which constitute a car; such as the internal combustion engine (ICE), fuel injection, clutch, transmission, differential, steering, suspension and brake system.

(b) Vehicle Structure

Vehicle structure covers the constructions, classifications and design of the vehicle chassis taking into consideration its load path that will affect its structural rigidity with regards to bending, torsion and lateral loading.

(c) Vehicle Dynamic

Vehicle dynamic covers the fundamental concepts of vehicle dynamics which consider the ride and comfort, handling, kinematics and kinetics behaviours of its essentials systems and subsystems.

(d) Vehicle Powertrain

Vehicle powertrain covers the engineering aspects of the vehicle powerplant (dominant by the internal combustion engines) and transmission (also known as drivetrain). It also covers the integration of drivetrain with the powerplant to predict the essential vehicle performances such as maximum speed, acceleration, driveability and fuel consumption.

(e) Automotive Electrical and Instrumentation System

This area of study introduces and explains the fundamental behaviours and characteristics of the automotive electrical and electronic related systems in a vehicle. Some general electrical system diagnosis methods will also be exposed.

(f) Automotive Production Technology

Automotive production covers the fundamental aspects of automotive production processes which emphasize on casting, forming and the challenging issues such as Quality Lean Manufacturing and Automation.

(g) Automotive Engineering Design

This area exposes students to automotive related engineering design activities; where real design project is to be undertaken in groups which require creativity, commitment, leadership and good public relation skills. Quality design tools such as QFD, DFM and DFA will be highlighted.

(h) Engine Turbocharging

Engine turbocharging is one of the key technologies to improve the engine performance and increase efficiencies. This area includes analysis and evaluation of the parameters in turbocharger and supercharger engines. The study includes the processes in

turbocharger-engine matching to achieve better engine performances.

(i) Internal Combustion Engine

This area of study covers the fundamental and applications of internal combustion engines, mainly on transportation. Projects in this field can vary from intake system configuration to combustion study and exhaust energy recovery. The area broadly aims for higher efficiency, lower fuel consumption and lower exhaust emissions, through experimental and simulation investigations.

CAREER PROSPECTS

Graduates of this programme are essentially Mechanical Engineers with minor specialization in Automotive Engineering who can seek job opportunities in various mechanical and automotive sectors. Alternatively, they can also be known as Automotive Engineers depending on their job placements in the industries, they are in.

Mechanical-Automotive graduates from UTM will be able to perform job requirements in the field of research, design, development and production of various types of vehicles. In most cases they will be working in the design and production of automotive components systems and sub-systems. They will make use of the knowledge learnt during their studies at UTM such as those mentioned earlier. A Mechanical-Automotive Engineer will always perform design or production work in accordance to quality assurance practice to fulfil the requirements of standards performance and safety.

Apart from passenger vehicles, Mechanical-Automotive graduates will also be able to find careers in the commercial vehicle industry or off-road vehicles companies such as MASTER BUILDERS and MALAYSIAN TRUCKS & BUS and even branch into locomotives companies. Furthermore, the advancement of motorsports related industry has created the need for technical expertise to support the industry; another exciting industry in which Mechanical-Automotive graduates can adapt as their career. Malaysia has been producing cars for more than 30 years with the growth of companies such as PROTON, PERODUA, MODENAS and NAZA. The rapid growth in the Malaysian automotive industry including component manufacturing and automotive-related companies has also provided many job opportunities for Mechanical-Automotive graduates.

UTM Mechanical-Automotive graduates are also capable to take a position and advance their career with international car manufacturers either locally or abroad. In short, UTM Mechanical-Automotive graduates have a wide career opportunity as they are all well trained to become competent engineers and managers, especially in the field of Mechanical-Automotive Engineering.

MOBILITY PROGRAMME (OUTBOUND)

Universiti Teknologi Malaysia (UTM) is offering five (5) types of mobility programs which allow UTM Student to go abroad and join academic programs in universities, institutions or organizations in all over the world. The opportunities offered are as below:

1. Study Abroad / Student Exchange

Study Abroad/Student Exchange programme is a programme which allow student to spend one or two semesters at universities abroad and take courses in regular semester with credit transfer opportunity.

2. Research Internship Abroad

Research Internship is a program which allow student to join research study or internship under the supervision of an academic staff at universities or industries abroad from all over the world.

3. Global Outreach Programme (GOP)

GOP is a 7 to 14 days academic based program to experience various cultures in other countries. It includes immersion elements such as research & academic activities, social responsibility and cross-cultural activities.

4. International Invitation Programme

Students participate in program organised by international institutions/ organisations with the following themes:

(iv) Seminar, Conference or Paper Presentation
(v) Cultural Exhibition and Conference
(vi) Student Development Activity

5. Summer School Abroad

Summer School program is a program which is designed to provide educational opportunities in 4 to 8 weeks during summer holiday abroad. It is related to environment, local community, heritage and tradition.

Details and appropriate forms and procedures can be reached at **UTM International link: http://www.utm.my/international/outbound-mobility-programs/**

COURSE MENU

YEAR 1 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1203	Statics*	3	
SEMM 1503	Engineering Drawing	3	
SEMM 1911	Experimental Methods	1	
SEMM 1921	Introduction to Mechanical Engineering	1	
SEEU1002	Electrical Technology	2	
SSCE 1693	Engineering Mathematics I	3	
UHLB 1112	English Communication Skills	2	
UHIS 1022	Philosophy and Current Issues (for Local Student Only)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilisations (for International Students Only)		
	Total	**17**	

YEAR 1 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1013	Programming for Engineers	3	
SEMM 1113	Mechanics of Solids I *	3	SEMM 1203
SEMM 1213	Dynamics*	3	SEMM 1203
SEMM 1513	Introduction to Design	3	SEMM 1503
SEEU 2012	Electronics	2	SEEU 1002
UHMT 1012	Graduate Success Attributes	2	
UHMS 1182	Appreciation of Ethics and Civilisations (for Local Students Only)	2	
UHLM 1012	Malay Language for Communication 2 (for International Students Only)	2	
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 2 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2123	Mechanics of Solids II*	3	SEMM 1113
SEMM 2313	Mechanics of Fluids I*	3	SEMM 1203
SEMM 2413	Thermodynamics*	3	
SEMM 2921	Laboratory I	1	SEMM 1911
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UHIT 2302	Thinking of Science and Technology	2	
UHLB 2122	Academic Communication Skills	2	UHLB 1122
	Total	**17**	

YEAR 2 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2223	Mechanics of Machines and Vibration*	3	SEMM 1213
SEMM 2323	Mechanics of Fluids II*	3	SEMM 2313
SEMM 2433	Applied Thermodynamics and Heat Transfer*	3	SEMM 2413
SEMM 2613	Materials Science	3	
SEMM 2713	Manufacturing Processes	3	
SSCE 1793	Differential Equations	3	SSCE 1693
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 3 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3023	Applied Numerical Methods	3	SEMM 1013, SSCE 1793
SEMM 3233	Control Engineering	3	SEMM 1213**, SSCE 1793**
SEMM 3523	Components Design	3	SEMM 2123**, SEMM 1513
SEMM 3931	Laboratory II	1	SEMM 2921
SEMV 3012	Automotive Technology	2	
UBSS 1032	Introduction to Entrepreneurship	2	
UKQF 2xx2	Co-curriculum and Service-Learning Elective	2	
	Total	**16**	

YEAR 3 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3033	Finite Element Methods	3	SEMM 2123**
SEMM 3183	Industrial Engineering	3	
SEMV 3413	Internal Combustion Engines	3	SEMM 2413, SSCE 1793
SEMV 3512	Automotive Engineering Design I	2	
SEMV 3941	Laboratory III	1	SEMM 3931
UHLB 3132	Professional Communication Skills	2	UHLB 2122
SSCE 2193	Engineering Statistics	3	
	Total	**17**	

YEAR 3 : SHORT SEMESTER			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3915	Industrial Training	5	##, SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
	Total	**5**	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Obtained minimum of 80 credits

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 4 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3622	Materials Technology	2	SEMM 2613**
SEMM 3823	Engineering Management, Safety and Economics	3	
SEMM 4912	Undergraduate Project I	2	SEMM 2123**, SEMM 2433**, SEMM 2223**, SEMM 2323**
SEMV 4212	Automotive Electronics & Instrumentation	2	SEMV 3012, SEMM 3242
SEMV 4213	Vehicle Dynamics	3	
SEMV 4523	Automotive Engineering Design II	3	SEMV 3512
UXXX 2xx2	Generic Skills or Knowledge Expansion Cluster Elective	2	
	Total	**17**	

YEAR 4 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4902	Engineering Professional Practice	2	Must be at least 3rd year
SEMM 4924	Undergraduate Project II	4	SEMM 4912
SEMV 4793	Automotive Production Technology	3	SEMV 3012, SEMM 2713
SEMV 4xx3	Elective	3	
SEMV 5xx3	PRISMS Elective		
UHLX 1112	Foreign Language Elective	2	
UKQT 3001	Extra-Curricular Experiential Learning	1	Completed three extracurricular experience programmes
	Total	**15**	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

* Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

ELECTIVE COURSES

Choose one (1) from the elective courses:

No.	Code	Courses
1	SEMV 4123	Vehicle Structure
2	SEMV 4413	Engine Turbocharging
3	SEMV 4423	Vehicle Powertrain

PRISMS ELECTIVE COURSES

For students who intend to enrol in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO	COURSE CODE	COURSE NAME	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (/) IF PASSED
MECHANICAL ENGINEERING COURSES					
1	SEMM 1013	Programming for Engineers	3	3	
2	SEMM 1113	Mechanics of Solids I	3	3	
3	SEMM 1203	Statics	3	3	
4	SEMM 1213	Dynamics	3	3	
5	SEMM 1503	Engineering Drawing	3	3	
6	SEMM 1513	Introduction to Design	3	3	
7	SEMM 1911	Experimental Methods	1	1	
8	SEMM 1921	Introduction to Mechanical Engineering	1	1	
9	SEMM 2123	Mechanics of Solids II	3	3	
10	SEMM 2223	Mechanics of Machines & Vibration	3	3	
11	SEMM 2313	Mechanics of Fluids I	3	3	
12	SEMM 2323	Mechanics of Fluids II	3	3	
13	SEMM 2413	Thermodynamics	3	3	
14	SEMM 2433	Applied Thermodynamics & Heat Transfer	3	3	
15	SEMM 2613	Materials Science	3	3	
16	SEMM 2713	Manufacturing Processes	3	3	
17	SEMM 2921	Laboratory I	1	1	
18	SEMM 3023	Applied Numerical Methods	3	3	
19	SEMM 3033	Finite Element Methods	3	3	
20	SEMM 3233	Control Engineering	3	3	
21	SEMM 3523	Component Design	3	3	
22	SEMM 3622	Materials Technology	2	2	
23	SEMM 3813	Industrial Engineering	3	3	
24	SEMM 3823	Engineering Management, Safety & Economics	3	3	
25	SEMM 3915	Industrial Training	5	HL	
26	SEMM 3931	Laboratory II	1	1	
27	SEMM 4902	Engineering Professional Practice	2	2	
28	SEMM 4912	Undergraduate Project I	2	2	
29	SEMM 4924	Undergraduate Project II	4	4	
30	SEMV 3012	Automotive Technology	2	2	
31	SEMV 3413	Internal Combustion Engines	3	3	

32	SEMV 3512	Automotive Engineering Design I	2	2	
33	SEMV 3941	Laboratory III	1	1	
34	SEMV 4212	Automotive Electronics & Instrumentation	2	2	
35	SEMV 4213	Vehicle Dynamics	3	3	
36	SEMV 4523	Automotive Engineering Design II	3	3	
37	SEMV 4793	Automotive Production Technology	3	3	
38	SEMV 4xx3	Elective	3	3	
	SEMV 5xx3	PRISMS Elective			
TOTAL CREDIT FOR MECHANICAL ENGINEERING COURSES (A)			**101**	**96**	
ELECTRICAL COURSES (School of Electrical Engineering)					
1	SEEU1002	Electrical Technology	2	2	
2	SEEU2012	Electronics	2	2	
TOTAL CREDIT FOR ELECTRICAL COURSES (B)			**4**	**4**	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
TOTAL CREDIT FOR MATHEMATICS COURSES (C)			**12**	**12**	
UNIVERSITY GENERAL COURSES					
CLUSTER 1: APPRECIATION OF PHILOSOPHY, VALUE & HISTORY					
1	UHIS 1022	Philosophy and Current Issues (for Local Students Only)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students Only)			
2	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
CLUSTER 2: GENERIC SKILLS					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UHMT 2012	Leadership	2	2	
3.	UHMS 2022	Critical and Creative Thinking	2	2	
4.	UHMS 2032	The Human side of Knowledge Management	2	2	
5.	UHMS 2042	Development and Global Issues	2	2	

6.	UHMT 2042	Guidance & Counselling	2	2	
7.	UHMT 2062	Psychology of Adjustment	2	2	
8.	UBSS 2072	Fundamentals of Intellectual Property Law	2	2	
9.	UBSS 2082	Law for Entrepreneurs	2	2	
10.	UBSS 2092	Entrepreneurship and Enterprise Development	2	2	
11.	UBSS 2102	Social Entrepreneurship	2	2	
12.	UHMS 2112	Engineering Communication	2	2	
13.	UHMS 2122	Human Communication	2	2	
14.	UHMT 2132	Professional Ethics	2	2	
15.	UMJT 2142	Professional Ethics, Safety and Health (Ningen Ryoku)	2	2	
CLUSTER 3: KNOWLEDGE EXHANCEMENT					
1.	UHIT 2302	Science and Technology Thinking	2	2	
2.	UHIT 1022	Science, Technology and Mankind	2	2	
3.	UHII 2012	Al-Qur'an and Human Civilization	2	2	
4.	UHIT 2032	Life Institutions and Sustainable Development	2	2	
5.	UHIZ 2042	Future Studies	2	2	
6.	UHIT 2052	Family Law	2	2	
7.	UHIZ 2062	World science	2	2	
8.	UHIS 2072	Sustainable Economy	2	2	
9.	UHIS 2082	Practice and Concept of Halal Management	2	2	
10.	UHII 2092	Philosophy of Islamic Art	2	2	
11.	UHII 2102	Islam and Health	2	2	
12.	UHII 2132	Islamic Entrepreneurship	2	2	
13.	UETS 2142	Sustainable Energy	2	2	
CLUSTER 4: CO-CURRICULUM & SERVICE LEARNING					
1	UKQX xxx2	Co-curriculum & Service-Learning Elective	2	2	
2	UKQE 3001	Extra-Curricular Experiential Learning	1	1	
CLUSTER 5: LANGUAGE SKILLS					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHLB 1032	Introductory Academic English	2	2	
5	UHLB 1042	Intermediate Academic English	2	2	
6	UHLA 1112	Arabic Language	2	2	

7	UHLJ 1112	Japanese Language 1	2	2	
8	UHLC 1112	Mandarin Language I	2	2	
9	UHLF 1112	French Language	2	2	
10	UHLN 1112	Persian Language	2	2	
11	UHLJ 1122	Japanese Language for Communication I	2	2	
12	UHLM 1112	Malay Language for Communication	2	2	
CLUSTER 6: ENTREPRENEURSHIP					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSES (D)			**23**	**23**	
TOTAL CREDIT TO GRADUATE (A + B + C + D)			**140**	**135**	
Note: # Choose one elective either from Cluster 2 (Generic Skills) or Cluster 3 (Knowledge Expansion) for UxxX 2xx2					
OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATION (PCS) • **Students are required to enrol and pass FIVE (5) PCS courses, in order to be eligible to graduate** • **Please refer to page FE 8 in UG Academic Handbook, for more information about PSC courses.**					
Compulsory PSC Courses (Enrol all 3 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
Elective PSC Courses (Choose 3 only)					
1	GSPX XXXX	Data Analytic for Organization			
2	GSPX XXXX	ISO 9001:2015 Quality Management System Requirement			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	How to Manage Your Personal Finance			

COURSE SYNOPSIS

CORE COURSES

SEMM 1013 - Programming for Engineers

This course formally introduces the concept of computers, algorithms, programming languages, pseudo-code, and design of programs for solution to computational engineering problems. The two programming languages introduced in this course are C and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting and model building.

SEMM 1113 - Mechanics of Solids I

The course provides students with the knowledge to determine the strength and stiffness of engineering structures being used. The structures that will be used in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SEMM 1203 - Statics

This course introduces students to the part of mechanic which is a pre-requisite for most engineering courses including SEMM 1213, SEMM 2313 and SEMM 1113. The course enables student to acquire the essential basic knowledge of resultant and equilibrium of forces. It will examine key elements in producing free body diagrams for particles and rigid bodies, as essential first step in solving applied mechanics problems. Exposure to the conceptof moment and equilibrium equations with reference of Newton's Law enhances the relevanceof friction, trusses, frames and machines applications. Students are also introduced to the concept of distributed forces, which include centroid and centre of gravity and the generated surface area and volume of revolution. Hence, students will be able to demonstrate and applythe knowledge in continuing subjects which requires the analytical skills developed in this subject.

SEMM 1213 - Dynamics

The course is an extension to SEMM 1203, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces energy and power to move a body.

SEMM 1503 - Engineering Drawing

This subject introduces student to the use of technical drawing in an effective way for communicating and integrating with engineering concepts. Such environment will provide a platform where the engineer can share and exchange information. This subject will also enlighten the student on the significant changes in the engineering and technical graphic due to the use of computer and CAD (Computer Aided Design) software. At the end of the course, student should be able to apply the skill and knowledge of engineering drawing to interpret design, using graphics method such as geometric drawing, orthographic projection, isometric, machine drawing, detailed drawing, and basic CAD software.

SEMM 1513 - Introduction to Design

This course is designed to introduce students to the concepts and methods of engineering design process in solving engineering design problems, creatively and effectively. The design process introduces problem background, concept generations and selections, development of selected concept and testing of selected concept by constructing and testing a prototype. This course serves as a preparation for students to proceed to higher level design classes.

SEMM 1911 - Experimental Methods

This course is conducted via lectures and experimental case study data. Students are exposed to the experimental method theory for the initial weeks and then followed by case study data. The lecture contents shall cover the fundamental of experimental method and the basic principles in measurements, instrumentation and analysis of results. It shall focus on the design of mechanical experiments, selection of sensors and transducers, estimation of errors and display of results. It shall also cover the analysis of results and how to prepare proper report writing. Student comprehension will be tested in two written tests. Based on the given experimental data, students are also expected to conduct statistical analysis of results and write the experimental outcome in a report.

SEMM 1921 - Introduction to Mechanical Engineering Profession

This course comprises of two modules intended to introduce students to the field of mechanical engineering. The first module raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of generic skills to engineers. It also provides students with a clear overview of different fields within Mechanical Engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skill required for an engineer entrepreneur. This course introduces students to the field of mechanical engineering. It raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of both technical and generic skills to mechanical engineers. It also provides students with a clear overview of different fields within mechanical engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skills required for an engineering entrepreneur.

SEMM 2123 - Mechanics of Solids II

The course is an extension to SEMM 1113, which is the pre-requisite to this course. It aims to extend the student's knowledge and understanding of the behaviour of materials and structures under a variety of loading conditions. The course starts off with plane stress and plane strain transformation, following which several elastic failures criteria's are investigated. The course provides an opportunity to investigate thick cylinders, structural deformation behaviour by using the energy method, instability problems of struts and elasto-plastic bending of beams. Determinate and indeterminate problems will be examined. At the end of the course, students should be able to calculate and evaluate stress, strain and deformation of structures in torsion and bending. They should also be able to evaluate failure modes and estimate fracture life of structures and components. The aspect of designing safe components and structures shall also be emphasized to the students.

SEMM 2223 - Mechanics of Machines and Vibration

The course requires SEMM 1213 as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines which include belt and pulley systems, gears, flywheels, governors and gyroscopes. Students will also be exposed to the methods of balancing rotating masses and parts of a combustion engine. The concept of vibration with respect to one-degree-freedom is also studied. At the end of the course, the students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

SEMM 2313 - Mechanics of Fluids I

The principle aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behaviour and flow. It will emphasize on the concept of pressure, hydrostatic pressure equation and its application in the measurement of pressure, static force due to immersed surfaces, floatation and buoyancy analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduce specially to solve flow measurement, mass or volumetric flow rate, momentum in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate an ability to analyse whether statically, dynamically or kinematically problems related directly to fluids.

SEMM 2323 - Mechanics of Fluids II

This course is designed to enhance the basic knowledge that has been developed in the first stage of Fluid Mechanics and expose the students in analysing hydrodynamically the flow field. It will emphasize on the analysis and the importance of ideal, boundary layer, and compressible flow in a practical engineering application. The course will also provide the analysis of flow through fluid machines such as pump and turbine. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to flow of fluids.

SEMM 2413 - Thermodynamics

Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle expressed in the First Law of Thermodynamics will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

SEMM 2423 - Applied Thermodynamics

The aim of this course is to teach second-year mechanical engineering students on the application of thermodynamics principles to evaluate the performance criteria of various thermal systems. These include the reciprocating air-compressor, internal combustion engines, vapour power plants, gas turbine plants and refrigeration systems. Also, principles of conservation of mass and energy are applied to various air-conditioning processes to assess the properties changes and energy transfer during the processes.

SEMM 2433 - Applied Thermodynamics & Heat Transfer

This course aims to develop a fundamental understanding of the processes by which heat and energy are inter-related and converted and by which heat is transferred. The course will review major principles of energy conversion and the modes of heat transfer. The basic laws of thermodynamics and the governing equations for heat transfer and thermodynamics will be introduced and subsequently used to solve practical engineering problems involving thermodynamics and heat transfer. The course will also cover fundamental principles of power generation systems.

SEMM 2613 - Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers and composites and their fundamental structures. The course will also provide basic diffusion mechanisms, metal solidification phase diagrams and heat treatment processes. At the end of the course, students should be able to apply the knowledge of atomic bonding and crystal structures to predict the physical and mechanical behaviour of materials and use the principlesof phase diagrams and heat treatments to the design of materials and their properties.

SEMM 2713 - Manufacturing Processes

This course discusses the fundamental aspect of various traditional and non-traditional manufacturing processes for metal and non-metal components. It starts from the overall introduction on manufacturing aspects followed by polymer shaping processes, casting processes, joining processes, metal forming processes and machining processes including CNC and CAM. At the end of this course, the students should be able to select suitable manufacturing processes to produce a part/product. The knowledge gained from this course also allows students to make right decision in designing products based on process requirements.

SEMM 2921 - Laboratory I

This course is introduced in the second year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It consists of six laboratories; Strengths of Materials Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluid Laboratory. Students will be grouped into 5 to 6 people for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3023 - Applied Numerical Methods

This course formally introduces the steps involved in engineering analysis (mathematical modelling, solving the governing equation, and interpretation of the results). Examples of case studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and partial differential equation are introduced.

SEMM 3033 - Finite Element Methods

This course gives students an exposure to the theoretical basis of the finite element method and its implementation principles and introduces the use of general-purpose finite element software for solving real-life engineering problems.

SEMM 3233 - Control Engineering

The course shall cover the essential and basic theory of control engineering. It shall cover the followings: open and closed-loop systems, manipulation of block diagram, signal flow graph and *Mason*'s rule, concept of transfer function, time response analysis, classification of system, control action, stability analysis, *Routh* criteria, root locus method, frequency analysis, *Nyquist* and *Bode* plots, relative stability from *Nyquist* and *Bode* diagrams and design of control system. MATLAB and Simulink software package shall be taught and used as a tool in solving control engineering problems where appropriate.

SEMM 3242 - Instrumentation

The course shall cover the essential and basic theory of instrumentation for undergraduate. It shall cover the following: fundamentals and components of instrumentation system, characteristics of instrumentation system, signal conditioning and application of sensors in measurements.

SEMM 3523 - Components Design

This course is designed to expose students in analysing machine design element failure theories. This includes failure due to static and fatigue loads. It involves fatigue strength and endurance level, modified stress Goodman diagram and fatigue design under tensile and combined stresses. The content will encompass the design and selection of bolts, welding, spring, ball and roller bearing, gears and belts. At the end of the course, students should have the capabilities to identify, analyse and design the machine elements in the perspective of static and fatigue failure aspect.

SEMM 3622 - Materials Technology

This course introduces students to the basic concepts required to understand and describe the mechanical behaviour and failure mechanism of metals. It will emphasise on the concept of stress intensity factor and fracture mechanics to predict failure of materials and provide understanding on conditions under which fatigue, and creep occur. The course will also introduce students to the theory of electromechanical corrosion in metallic materials, estimate the corrosion rate and understand the methods to control and manage corrosion. By the end of the course, students should be able to apply the criteria of failure to the design of materials and conduct failure analysis of engineering components. This course also covers the properties, processing and applications of non-metallic materials mainly polymer, ceramic and composite.

SEMM 3915 - Industrial Training

Industrial training exposes students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning that requires the students to learn the process and able to apply their knowledge acquired in class in actual industrial setting. The knowledge acquired during practical training may be used later in final year classes as well as to equip them with sufficient knowledge for job interviews.

SEMM 3931 - Laboratory II

This course is introduced in the third year of Mechanical Engineering programme involving two hours per week and experimental based courses. It consists of six laboratories; Strength of Materials Laboratory, Thermodynamics Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluids Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3941 - Laboratory III

This course is introduced in the third year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It is divided into two parts; experimental work at System & Control and Vibration Laboratories and a problem- based-learning (PBL) laboratory (module) depending on the topics/labs facilitated by a lecturer. Students have to produce a short report for the experimental work similar to those in Laboratory I and II. The second part, i.e., the lab module is based on the PBL concept. Student have to plan and design their own experimental work right from the very beginning until the end of the module based on the topics given by the lecturer. Students will be grouped into 5 to 6 for each module. In general, every group have to conduct two experimental works and two modules. At the end of the session, students have to submit two short reports and two formal reports.

SEMM 4902 - Engineering Professional Practice

This course introduces students to engineering ethics and an engineer's responsibilities towards safety, health and welfare of the public. It emphasizes on the engineer as a professional man, engineers & society, code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practice. The course will also introduce students to organize, in a group, a community service activity in a planned and structured manner. At the end of the course, students should be able to demonstrate and apply engineering professional ethics in their career as an engineer.

SEMM 4912 - Undergraduate Project I

This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given a topic on a project, students have to identify a problem, gather relevant information to the problem and propose solutions to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

SEMM 4924 - Undergraduate Project II

This course is the continuation of Undergraduate Project (UGP). It enhances the students' knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and the ability to plan and manage their work effectively. This course will also develop the students' capability to present, discuss and analyse results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

SEMV 3012 - Automotive Technology

This course introduces students the fundamental knowledge of automotive areas including different modern automotive system and components such as engine, transmission, differential, clutches, brakes, steering and suspension. Students will be exposed the principle function and working mechanism of the system. The new technology associated with different systems will also be introduced to enable student to identify the advancement in the technology. Students will also have some hands-on work to be done in automotive laboratory which will give them exposure to work on real automotive components and systems.

SEMV 3413 - Internal Combustion Engine

This course is intended to provide students an introduction, terminology, definition, and operating characteristics of internal combustion engines (ICE). It covers all topics needed for a basic engineering knowledge of the design, operation, analysis and performance of IC engines. Principles of all types of IC engines are covered including spark ignition (gasoline), compression ignition (diesels), four-stroke, and two-stroke engines. On top of that, students will be equipped with basic knowledge and understanding of engine heat transfer, frictions and lubrication. Moreover, an introduction on fuel-cell, hybrid and other alternative fuels are also covered.

SEMV 3512 - Automotive Engineering Design I

In this problem-based learning course, students will have to undertake (in group) one mechanical-automotive engineering design exercise which involves current trend in automotive technology. The main aim of this course is for the students to experience how to undertake real group design project which involves the latest automotive technology. Students will have to go through the process of applying various techniques and scientific principles (which they have learnt in this programme) in order to achieve their goals. Students will also be taught to be creative, brainstorm their ideas, discuss, design and analyse their developed design. Concurrently, students will also be given lectures related to mechanical engineering design process and engineering design method (technology-independent), based on relevant engineering design books.

SEMV 3941 - Laboratory III

This course is introduced in the third year of the study of Mechanical Engineering, three hours per week and experimental based course. It is divided into two parts; experimental work at Mechanics of Machine Laboratory and problem-based-learning (PBL) based laboratory (module). Students have to produce a short report for the experimental work as same to experimental work at year 2. But for the module, it is based on PBL concept. Students have to plan and design their experimental work from beginning until the end based on the title and objective that have been given by the lecturer. Students will be grouped into 5 to 6 for each module. Generally, every group has to conduct two experimental works and two modules. At the end of the session, students have to submit two short reports and two formal reports.

SEMV 4212 - Automotive Electronics and Instrumentation

This course gives students an exposure to electronic and instrumentation systems typically used in automotive vehicles. It covers the basics of transducers and their uses in automotive instrumentation systems. The interface between transducers and microcontrollers are also covered for automotive applications. Major electronic systems in automotive vehicles (e.g. starting and charging system, electric, hybrid and autonomous vehicle systems) are also introduced and discussed in the course.

SEMV 4213 - Vehicle Dynamics

This course introduces students to the fundamentals of vehicle dynamics such as vehicle axis system, equation of motions, moments and products of inertia, body/chassis stiffness and vibrations. Students will be taught the knowledge to develop equation of motions of vehicle dynamics model and to analyse its performance in terms of ride, comfort & handling behaviour.

SEMV 4523 - Automotive Engineering Design II

In this problem-based learning course, students need to develop and fabricate (in group) one mechanical-automotive engineering system which involves both mechanical and electronic system integrations, which its specifications had been determined in Automotive Engineering Design 1. The main aim of this course is for the students to experience how to deliver an automotive system project involving the latest automotive technology, which emphasizes more on detailed engineering analysis and system fabrication. Students will have to go through the process of applying various techniques and scientific principles (which they have learnt in prerequisite subjects) in order to achieve their goals. At the end of the semester, the students

are required to produce one automotive system which comprises an integration between both mechanical and electronics systems.

SEMV 4793 - Automotive Production Technology
This course introduces students to the advances of manufacturing processes involved in the production of selected automotive parts. Further enhancement of basic manufacturing processes through analysis of selected critical parameters in stamping operation is also given. A brief overview on other processes such as joining, injection moulding, thermoforming, etc are highlighted. The course will also highlight some of the challenging issues such as Quality improvement implementation, Lean Manufacturing and Automation.

ELECTIVES

SEMV 4413 - Engine Turbocharging
This course is designed to deliver the principles of engine boosting and the its significant role towards engine downsizing. The course will emphasize on the engine air induction system, in particular the turbocharging and supercharging systems. Students will be introduced to the science governing the operation of turbochargers and superchargers – which covers aerodynamics, gas dynamics and thermodynamics. The syllabus will enable the students to have the view of a turbocharger designer, as well as enable them to recognize the common problems relating to turbocharging an internal combustion engine. Engine downsizing is one of the crucial steps undertaken by engine manufacturers towards carbon reduction and sustainable technology. However, it requires significant technology advancement in all aspects of engine sub-systems, to deliver the targeted performance. The specific contributions of engine boosting to meet these targets will be discussed and elaborated as part of the course

SEMV 4123 - Vehicle Structure
This course is designed to expose students to the design of the modern passenger car structure. It will emphasize on the general architecture of the vehicle structure, design specifications for the body structure, methodology for evaluation of body structure performance.

SEMV 4423 - Vehicle Powertrain
This course introduces students to the fundamental of vehicle powertrain engineering systems. Students will be lectured on vehicle powertrain system that employs manual and automatic transmissions that uses either dry friction clutch or hydraulic torque converter and how to predict its performances. Students will be taught on how to match engine (internal combustion engine – ICE) and the different types of transmission systems in predicting the vehicle performances. The performances prediction that will be covered in this course are how to determine vehicle gradeability, top speed, acceleration and steady state fuel consumptions. In conjunction to these, students will be thought on how to determine top, bottom and intermediate gear ratios taking into consideration over gearing and under gearing conditions; and exploiting the current new continuously variable transmission (CVT) technology capability to achieve the above vehicle performances will be highlighted.

BACHELOR OF NAVAL ARCHITECTURE & OFFSHORE ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATION

The Bachelor of Naval Architecture & Offshore Engineering with Honours is offered on a full-time basis at the UTM Main Campus in Johor Bahru. The duration of study for the programme is subjected to the student's entry qualifications and is between four (4) years to a maximum of six (6) years.

The programme is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessments are based on coursework, assignments, projects and final examinations given throughout the semester. Description of the programme is provided below.

General Information

1.	**Awarding Institution**	Universiti Teknologi Malaysia
2.	**Teaching Institution**	Universiti Teknologi Malaysia
3.	**Programme Name**	Bachelor of Naval Architecture & Offshore Engineering with Honours
4.	**Final Award**	Bachelor of Naval Architecture & Offshore Engineering with Honours
5.	**Programme Code**	SEMOH
6.	**Professional or Statutory Body of Accreditation**	Engineering Accreditation Council (EAC)
7.	**Language(s) of Instruction**	Bahasa Melayu and English
8.	**Mode of Study (Conventional, distance learning, etc.)**	Conventional
9.	**Mode of Operation (Franchise, self-govern, etc.)**	Self-govern
10.	**Study Scheme (Full Time / Part Time)**	Full Time
11.	**Study Duration**	Minimum : 4 years Maximum : 6 years

Type of Semester	No of Semesters	No of Weeks/Semester
Normal	8	14
Short	1	8

12.	**Entry Requirements**	Matriculation / STPM / Diploma or equivalent

Course Classification

No	Classification	Credit Hours	Percentage
i.	University Courses (a) General (b) Language (c) Entrepreneurship (d) Co-Curriculum (e) Mathematics	 10 8 2 3 12	25%
ii.	Mechanical Core	41	29%
iii.	Programme Core	62	44%
iv.	Programme elective	2	2%
	Total	**140**	**100%**
Classification of courses for engineering programme			
A	Engineering Courses (a) Lecture/Project/ Laboratory (b) Workshop/Field/Design Studio (c) Industrial Training (d) Final Year Project	 94 0 5 6	75%
	Total Credit Hours for Part A	**105**	
B	Non-Engineering (y) Applied Science/Mathematic/Computer (z) Management/Law/Humanities/Ethics/Economy (aa) Language (bb) Co-Curriculum	 12 12 8 3	25%
	Total Credit Hours for Part B	**35**	
Total credit hours for Part A and B		**140**	**100%**
Total Credit Hours to Graduate		**140 credit hours**	

AWARD REQUIREMENTS

To graduate, students must:

- Attain a total of not less than 140 credit hours with a minimum CGPA of 2.00.
- Has passed all specified courses.
- Has applied for graduation and has been approved by the University.
- Has completed all five (5) Professional Skills Certification (PSC) courses in UTM
- Other condition as specified.

AREAS OF STUDY

Naval Architecture and Offshore Engineering are two important sectors in the maritime industry. The area of studies includes the design and system design, operations, performance and dynamic behaviour of marine vehicles such as ships, and also other marine structures fixed or floating. The curriculum has about forty-five percent (45%) containing basic engineering courses such as Statics, Dynamics, Thermodynamics, Fluid Mechanics, and Mechanics of Materials. Naval architecture and offshore engineering related courses are about forty percent (40%). The courses are introduced as early as in the first semester and more courses are offered towards the end of the study period. The specialised courses for Naval Architecture and Offshore Engineering include: -

(a) Naval Architecture

Naval Architecture is a study which introduces students to basic naval architectural knowledge. It enables students to familiarise themselves with naval architectural terms, ship components and undertakes simple hydrostatics and stability calculations. Tools and techniques which are required in future naval architecture work are introduced here. Students will be able to carry out calculations to determine ship stability in all conditions. The content covers calculation of areas, moments and centroids, transverse stability, longitudinal stability, large angle stability, damage stability, launching.

(b) Marine Hydrodynamics

Basic knowledge of marine hydrodynamics theory and CFD software are introduced. Enhancement of knowledge in Mechanics of Fluids I started with some discussion on motion of Viscous/Real fluid and an Ideal fluid. Further discussion is also given in surface waves and hydrodynamic of slender bodies.

(c) Ship and Offshore Structures

Ship and Offshore Structures concerns with the knowledge on loading and stresses of ship and offshore structure. It begins with the components and functions on ship and offshore structures. The floating hull loading, shear forces and bending moments will then discuss in detail. The important structural strength analysis for ship and offshore structures will be highlighted on bending and buckling afterward.

(d) Ship and Offshore Production Technology

Ship and Offshore Production Technology study is essential as it prepare the student with the basic knowledge and exposure on construction process of ship & offshore structures. This course covers the hardware and software aspects of ship and offshore production technology. It begins with the introduction to ship building industry, its importance and development in world economics and in Malaysia, ship and offshore/production construction process flow chart and activities. Production /construction yard's location, layout and facilities. Material treatment including surface preparation, cutting process, welding and painting process which involve in the construction process. It followed by subassembly, block assembly and erection process of offshore structures. Upon completion, launching, transporting, and upsetting process will also be discussed. On the soft engineering side, the quality control and production system will also be taught. Apart from normal lecture hours, the students are expected

to carry out class assignment, field surveys or site visits to ship and offshore production yards and technical writing. Therefore, the course is expected to develop and enhance the students' ability to discuss and explain the related knowledge, to work in team effectively, long life learning and communication skills.

(e) Integrated Ship and Offshore Design Project

The course firstly explains the concepts of engineering design and later relates them to the process and procedures in ship and offshore design. Emphasis is made on preliminary design calculations to satisfy owner's requirements and related legislations. The hands-on part will deal with design tasks, including hull form design (manually and computer aided), hydrostatics calculation and General Arrangement.

In terms of design, the students will be given areal design job and working as consultant group to closely replicates the real ship and offshore design practice. Designing ship hull forms and its related general arrangement to serve its functions done previously, this course also continuing the necessary design tasks including Stability Calculation and Assessment, Scantling Calculation and Strength Assessment, and Shell Expansion & material take off. This course emphasis is Handson Design Project works (in group) with continuous monitoring from the lecturer. Apart from providing the necessary technical knowledge and skills the course also aimed at developing the necessary generic skills such as team working, oral and written presentation skills, project management skills etc. The contents and conduct of the design project areas much as possible tailored to the real design practice in industry.

(f) Marine and Offshore Engineering Systems

The course covers the main engineering systems of the ship and offshore structure machinery. This includes the propulsion and auxiliary systems. Selected analysis of the thermodynamic processes of the system, description of the plant main components, operating principles and plant performances will be studied. This includes the marine diesel engine and steam turbine power plant, electric and hydraulic power systems. Other important support system such as air conditioning, fire, condition and Performance monitoring system will also be covered.

(g) Marine Transport Economic

The course focuses on delivering knowledge to students on two aspects of maritime transport and economics. Firstly, is on the basic definitions and process for the efficient operation of global port and shipping operations. Secondly is on the basic definition for the economics of port and shipping operations up to the concepts for appraising investment and financial performance. Additional knowledge is also given to students on the current issues influencing the world maritime scenario. The topics selected are globalization, technology and knowledge while addressing environmental issues.

(h) Marine Management, Environment and Safety

This course aims to prepare students with knowledge on basic principles of management, project management, marine environment and safety. The management part will examine key issues in management and organization, past and present

management, strategic management, organizational structure and design, human resource management, motivating employees and leadership. Project management shall cover network analysis, resources constrained project, crash time and project performance and risk assessment. Main topics covered under environment and safety will be IMO, MARPOL, SOLAS and the like. OSHA1994, Factories and Machinery Act 1967 shall also be mentioned. Safety topics cover hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. At the end of the course, students should be able to describe fundamental aspects of management, integrate knowledge in engineering and management in making business decisions, apply the principles of hazard identification, risk assessment/control, plan, design and implement an effective safety program.

(i) Ship Resistance and Propulsion

This course introduces students to ship hydrodynamics, dimensional analysis, fundamental of ship resistance and its components, fundamental of ship model testing and extrapolation methods and marine propulsors. The course also includes propeller theories, methods of propeller design and the study of cavitation phenomena together with the analysis of propeller-engine matching.

CAREER PROSPECTS

Graduates of this programme are essentially Naval Architects, but with applied knowledge on offshore engineering. They could be registered with the Board of Engineers Malaysia (BEM) under the category of Naval Architect and join the Institute of Engineers Malaysia (IEM).

The Maritime Industry encompasses all forms of maritime activity and can be divided into several segments namely, Shipbuilding & Ship Repair, Offshore Structure and Vessels Fabrication, Ocean & Coastal Shipping Port Services, Marine Professional Services, Maritime Defence and Law Enforcement, Government Authorities & Marine/Maritime Associations, Marine and Inland Fishing, Marine Tourism, Marine Mining, Marine Environment and Marine Products & Services.

There are excellent employment opportunities in all these segments of the maritime industry.

Naval Architects have a wide range of employment opportunities, not limited to areas such as Ship and Offshore Vessel Design, Construction and Repair, Consultancy, Marketing and Sales, Operations, Regulation, Surveying and Overseeing, Research and Development and in the Education and Training sector.

Naval Architects and Offshore Engineers play a vital role in the delivery of the many complex and challenging projects being developed. This is possible since they have the ability to model and solve a problem, describe and deliver an economical solution and then supervise and manage the work through to completion. The end product needs to be feasible, economical, safe, delivered on time, as well as respectful to the environment. All of these require a special combination of aptitude, vision and commitment.

Each type of work has its own distinctive character and offers opportunities for initiative and imagination in a wide variety of technical and managerial posts as well as opportunities for foreign travel. The workplace may be a large company, a small group, a consultancy or a government department.

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Demonstrate academic and technological excellence professionally and globally, particularly in areas related to naval architecture and offshore engineering practices and contribute innovatively to the nation's wealth creation.
PEO2	Career advancement by achieving higher levels of responsibility, leadership and acquiring professional and advanced academic qualifications.
PEO3	Recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of their work and society.
PEO4	Adapt and communicate effectively and be successful working with multi-disciplinary teams.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Ability to acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex naval architecture and offshore engineering problems; Keywords: **Engineering Knowledge**
PLO2	Ability to identify, formulate and analyse complex naval architecture and offshore engineering problems; Keywords: **Problem Analysis**
PLO3	Design solutions for complex naval architecture and offshore engineering problems that fulfil health, safety, societal, cultural and environmental needs; Keywords: **Design/Development of Solutions**
PLO4	Investigate complex naval architecture and offshore engineering problems using research-based knowledge and methods to produce conclusive results; Keywords: **Investigation**
PLO5	Use modern engineering and information technology (IT) tools in complex naval architecture and offshore engineering activities, with an understanding of limitations; Keywords: **Modern Tools Usage**
PLO6	Apply professional engineering practice and solutions to complex naval architecture and offshore engineering problems related to societal, health, safety, legal and cultural issues with full responsibility and integrity; Keywords: **The Engineer and Society**
PLO7	Evaluate the sustainability and impact of professional engineering work in the

	solutions of complex naval architecture and offshore engineering problems in societal and environmental contexts; Keywords: **Environment and Sustainability**
PLO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice; Keywords: **Ethics**
PLO9	Communicate effectively on complex naval architecture and offshore engineering activities both orally and in writing; Keywords: **Communication**
PLO10	Work productively as an individual, and as a member or leader in a team that may involve multi- disciplinary settings; Keywords: **Team Working**
PLO11	Undertake lifelong learning and manage information including conducting literature study; Keywords: **Lifelong Learning**
PLO12	Demonstrate and apply knowledge on finance and management principles and acquire entrepreneurship skill; Keywords: **Project Management, Finance & Entrepreneurship**

MOBILITY PROGRAMME (OUTBOUND)

Universiti Teknologi Malaysia (UTM) is offering five (5) types of mobility programs which allow UTM Student to go abroad and join academic programs in universities, institutions or organizations in all over the world. The opportunities offered are as below:

1. Study Abroad / Student Exchange

Study Abroad/Student Exchange programme is a programme which allow student to spend one or two semesters at universities abroad and take courses in regular semester with credit transfer opportunity.

2. Research Internship Abroad

Research Internship is a program which allow student to join research study or internship under the supervision of an academic staff at universities or industries abroad from all over the world.

3. Global Outreach Programme (GOP)

GOP is a 7 to 14 days academic based program to experience various cultures in other countries. It includes immersion elements such as research & academic activities, social responsibility and cross-cultural activities.

4. International Invitation Programme

Students participate in program organised by international institutions/ organisations with the following themes:

(i) Seminar, Conference or Paper Presentation
(ii) Cultural Exhibition and Conference
(iii) Student Development Activity

5. Summer School Abroad

Summer School program is a program which is designed to provide educational opportunities in 4 to 8 weeks during summer holiday abroad. It is related to environment, local community, heritage and tradition.

Details and appropriate forms and procedures can be reached at **UTM International link: http://www.utm.my/international/outbound-mobility-programs/**

COURSE MENU

YEAR 1 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1203	Static*	3	
SEM0 1503	Ship Engineering Drawing	3	
SEMM 1911	Experimental Methods	1	
SEMO 1922	Introduction to Naval Architecture and Offshore Engineering	2	
SEEU 1002	Electrical Technology	2	
SSCE 1693	Engineering Mathematics I	3	
UHLB 1112	English Communication Skills	2	
UHIS 1022	Philosophy and Current Issues (for Local Student Only)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilisations (for International Students Only)		
Total		**18**	

YEAR 1 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1013	Programming for Engineers	3	
SEMM 1113	Mechanics of Solids I*	3	SEMM 1203
SEMM 1213	Dynamics*	3	SEMM 1203
SEMO 1332	Naval Architecture I	2	SEMO 1503
SSCE 1793	Differential Equations	3	SSCE 1693
UHMT 1012	Graduate Success Attributes	2	
UHMS 1182	Appreciation of Ethics and Civilisations (for Local Student Only)	2	
UHLM 1012	Malay Language for Communication 2 (for International Students Only)		
Total		**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 2 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2313	Mechanics of Fluids I*	3	SEMM 1203
SEMM 2413	Thermodynamics*	3	
SEMM 2613	Materials Science	3	
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UHLB 2122	Academic Communication Skills	2	UHLB 1122
UHIT 2302	Thinking of Science & Technology	2	
Total		**16**	

YEAR 2 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2223	Mechanics of Machines and Vibration*	3	SEMM 1213
SEMO 2123	Ship and Offshore Structures I	3	SEMM 1113
SEMO 2323	Marine Hydrodynamics	3	SEMM 2313
SEMO 2713	Ship & Offshore Production Technology	3	
SEMM 2921	Laboratory I	1	SEMM 1911
SEEU 2012	Electronics	2	SEEU 1002
SSCE 2193	Engineering Statistics	3	
Total		**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 3 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3023	Applied Numerical Methods	3	SEMM 1013, SSCE 1793
SEMM 3931	Laboratory II	1	SEMM 2921
SEMO 3512	Ship and Offshore Design	2	SEMO 1332
SEMO 3333	Naval Architecture II	3	SEMO 1332
SEMO 3353	Ship Resistance and Propulsion	3	
SEMO 3813	Marine Transport and Economics	3	
UKQF 2xx2	Co-Curriculum Service-Learning Elective	2	
Total		**17**	

YEAR 3 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMO 3033	Computational Methods in Ocean Engineering	3	
SEMM 3242	Instrumentation	2	SEEU 2012**
SEMM 3623	Materials Engineering	3	SEMM 2613
SEMO 3133	Ship and Offshore Structure II	3	SEMO 2123**
SEMO 3523	Integrated Ship & Offshore Design Project I	3	SEMO 3512
UBSS 1032	Introduction to Entrepreneurship	2	
UHLB 3132	Professional Communication Skills	2	UHLB 1112, UHLB 2122
Total		**18**	

SHORT SEMESTER			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMO 3915	Industrial Training		##, SEMO 2123**, SKMM 2223**
Total		**5**	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Obtained minimum of 80 credits

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 4 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMO 4233	Dynamics of Marine Vehicles	3	SEMM 2223, SEMO 2323
SEMO 4423	Marine and Offshore Engineering System	3	SEMM 2413
SEMO 4533	Integrated Ship & Offshore Design Project II	3	SEMO 3523
SEMO 4912	Undergraduate Project I	2	SEMM 2223**, SEMO 2123**
SEMO 4262	Risers & Mooring Dynamics	2	
UXXX 2xx2	Generic Skills or Knowledge Expansion Cluster Elective	2	
Total		**15**	

YEAR 4 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4902	Engineering Professional Practice	2	Must be 3rd year
SEMO 4924	Undergraduate Project II	4	SEMO 4912
SEMO 4823	Marine Management, Safety and Environment	3	
SEMO 4951	Marine Laboratory	1	
SEMO 4xx2	Marine and Offshore Elective	2	
UHLX 1112	Foreign Language Elective	2	
UKQT 3001	Extra-Curricular Experiential Learning	1	Completed three extracurricular experience programmes
Total		**15**	

Subject to changes

**** Minimum grade D- (30%) in the pre-requisite courses**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

* Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

MARINE AND OFFSHORE ELECTIVE COURSES

Choose one (1) from Elective

SEMO 4012 Marine Meteorology and Oceanography

SEMO 4132 Marine Control Engineering

SEMO 4142 Reliability of Ship and Offshore Structures

SEMO 4152 Platform, Pipeline and Sub-Sea Technology

SEMO 4452 Marine Engineering System Project

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO	COURSE CODE	COURSE NAME	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (/) IF PASSED
MECHANICAL ENGINEERING COURSES					
1	SEMM 1013	Programming for Engineers	3	3	
2	SEMM 1113	Mechanics of Solids I	3	3	
3	SEMM 1203	Statics	3	3	
4	SEMM 1213	Dynamics	3	3	
5	SEMO 1503	Ship Engineering Drawing	3	3	
6	SEMO 1332	Naval Architecture I	2	2	
7	SEMM 1911	Experimental Methods	1	1	
8	SEMM 2223	Mechanics of Machines & Vibration	3	3	
9	SEMM 2313	Mechanics of Fluids I	3	3	
10	SEMM 2413	Thermodynamics	3	3	
11	SEMM 2613	Materials Science	3	3	
12	SEMM 2921	Laboratory I	1	1	
13	SEMM 3023	Applied Numerical Methods	3	3	
14	SEMO 3033	Computational Methods in Ocean Engineering	3	3	
15	SEMM 3242	Instrumentation	2	2	
16	SEMM 3623	Materials Engineering	3	3	
17	SEMM 3931	Laboratory II	1	1	
18	SEMM 4902	Engineering Professional Practice	2	2	
19	SEMO 1922	Introduction to Naval Architecture & Offshore Engineering	2	2	
20	SEMO 2123	Ship & Offshore Structures I	3	3	
21	SEMO 2713	Ship & Offshore Production Technology	3	3	
22	SEMO 2323	Marine Hydrodynamics	3	3	
23	SEMO 3512	Ship & Offshore Design	2	2	
24	SEMO 3333	Naval Architecture II	3	3	
25	SEMO 3353	Ship Resistance & Propulsion	3	3	
26	SEMO 3133	Ship & Offshore Structures II	3	3	
27	SEMO 3523	Integrated Ship & Offshore Design Project 1	3	3	
28	SEMO 3813	Marine Transport & Economics	3	3	
29	SEMO 3915	Industrial Training	5	HL	
30	SEMO 4233	Dynamics of Marine Vehicles	3	3	
31	SEMO 4423	Marine & Offshore Engineering System	3	3	

32	SEMO 4533	Integrated Ship & Offshore Design Project II	3	3	
33	SEMO 4823	Marine Management, Safety & Environment	3	3	
34	SEMO 4912	Undergraduate Project I	2	2	
35	SEMO 4924	Undergraduate Project II	4	4	
36	SEMO 4941	Marine Laboratory	1	1	
37	SEMO 4262	Risers & Mooring Dynamics	2	2	
38	SEMO 4xx2	Marine & Offshore Elective	2	2	
TOTAL CREDIT FOR ENGINEERING COURSES (A)			**101**	**96**	
ELECTRICAL COURSES (School of Electrical Engineering)					
1	SEEU 1002	Electrical Technology	2	2	
2	SEEU 2012	Electronics	2	2	
TOTAL CREDIT FOR ELECTRICAL COURSES (B)			**4**	**4**	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
TOTAL CREDIT FOR MATHEMATICS COURSES (C)			**12**	**12**	
UNIVERSITY GENERAL COURSES					
CLUSTER 1: APPRECIATION OF PHILOSOPHY, VALUE & HISTORY					
1	UHIS 1022	Philosophy and Current Issues (for Local Students Only)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students Only)			
2	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
CLUSTER 2: GENERIC SKILLS					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UHMT 2012	Leadership	2	2	
3.	UHMS 2022	Critical and Creative Thinking	2	2	
4.	UHMS 2032	The Human side of Knowledge Management	2	2	
5.	UHMS 2042	Development and Global Issues	2	2	
6.	UHMT 2042	Guidance & Counselling	2	2	
7.	UHMT 2062	Psychology of Adjustment	2	2	
8.	UBSS 2072	Fundamentals of Intellectual	2	2	

		Property Law			
9.	UBSS 2082	Law for Entrepreneurs	2	2	
10.	UBSS 2092	Entrepreneurship and Enterprise Development	2	2	
11.	UBSS 2102	Social Entrepreneurship	2	2	
12.	UHMS 2112	Engineering Communication	2	2	
13.	UHMS 2122	Human Communication	2	2	
14.	UHMT 2132	Professional Ethics	2	2	
15.	UMJT 2142	Professional Ethics, Safety and Health (Ningen Ryoku)	2	2	
CLUSTER 3: KNOWLEDGE EXHANCEMENT					
1.	UHIT 2302	Science and Technology Thinking	2	2	
2.	UHIT 1022	Science, Technology and Mankind	2	2	
3.	UHII 2012	Al-Qur'an and Human Civilization	2	2	
4.	UHIT 2032	Life Institutions and Sustainable Development	2	2	
5.	UHIZ 2042	Future Studies	2	2	
6.	UHIT 2052	Family Law	2	2	
7.	UHIZ 2062	World science	2	2	
8.	UHIS 2072	Sustainable Economy	2	2	
9.	UHIS 2082	Practice and Concept of Halal Management	2	2	
10.	UHII 2092	Philosophy of Islamic Art	2	2	
11.	UHII 2102	Islam and Health	2	2	
12.	UHII 2132	Islamic Entrepreneurship	2	2	
13.	UETS 2142	Sustainable Energy	2	2	
CLUSTER 4: CO-CURRICULUM & SERVICE LEARNING					
1	UKQF 2xx2	Co-curriculum & Service-Learning Elective	2	2	
2	UKQT 3001	Extra-Curricular Experiential Learning	1	1	
CLUSTER 5: LANGUAGE SKILLS					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHLB 1032	Introductory Academic English	2	2	
5	UHLB 1042	Intermediate Academic English	2	2	
6	UHLA 1112	Arabic Language	2	2	
7	UHLJ 1112	Japanese Language 1	2	2	
8	UHLC 1112	Mandarin Language I	2	2	
9	UHLF 1112	French Language	2	2	
10	UHLN 1112	Persian Language	2	2	
11	UHLJ 1122	Japanese Language for Communication I	2	2	
12	UHLM 1112	Malay Language for Communication	2	2	

CLUSTER 6: ENTREPRENEURSHIP					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSES (D)			**23**	**23**	
TOTAL CREDIT TO GRADUATE (A + B + C + D)			**140**	**135**	
Note: # Choose one elective either from Cluster 2 (Generic Skills) or Cluster 3 (Knowledge Expansion) for UxxX 2xx2					
OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATION (PCS) • **Students are required to enrol and pass FIVE (5) PCS courses, in order to be eligible to graduate** • **Please refer to page FE 8 in UG Academic Handbook, for more information about PSC courses.**					
Compulsory PSC Courses (Enrol all 3 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
Elective PSC Courses (Choose 3 only)					
1	GSPX XXXX	Data Analytic for Organization			
2	GSPX XXXX	ISO 9001:2015 Quality Management System Requirement			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	How to Manage Your Personal Finance			

COURSE SYNOPSIS

CORE MECHANICAL COURSES

SEMM 1013 - Programming for Engineers

This course formally introduces the concept of computers, algorithms, programming languages, pseudo-code, and design of programs for solution to computational engineering problems. The two programming languages introduced in this course are C and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting and model building.

SEMM 1113 - Mechanics of Solids I

The course provides students with the knowledge to determine the strength and stiffness of engineering structures being used. The structures that will be used in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SEMM 1203 - Statics

This course introduces students to the part of mechanic which is a pre-requisite for most engineering courses including SEMM 1213, SEMM 2313 and SEMM 1113. The course enables student to acquire the essential basic knowledge of resultant and equilibrium of forces. It will examine key elements in producing free body diagrams for particles and rigid bodies, as essential first step in solving applied mechanics problems. Exposure to the conceptof moment and equilibrium equations with reference of Newton's Law enhances the relevanceof friction, trusses, frames and machines applications. Students are also introduced to the concept of distributed forces, which include centroid and centre of gravity and the generated surface area and volume of revolution. Hence, students will be able to demonstrate and applythe knowledge in continuing subjects which requires the analytical skills developed in this subject.

SEMM 1213 - Dynamics

The course is an extension to SEMM 1203, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces energy and power to move a body.

SEMM 1911 - Experimental Methods

This course is conducted via lectures and experimental case study data. Students are exposed to the experimental method theory for the initial weeks and then followed by case study data. The lecture contents shall cover the fundamental of experimental method and the basic principles in measurements, instrumentation and analysis of results. It shall focus on the design of mechanical experiments, selection of sensors and transducers, estimation of errors and display of results. It shall also cover the analysis of results and how to prepare proper report writing. Student comprehension will be tested in two written tests. Based on the given experimental data, students are also expected to conduct statistical analysis of results and write the experimental outcome in a report.

SEMM 2223 - Mechanics of Machines and Vibration

The course requires SEMM 1213 as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines which include belt and pulley systems, gears, flywheels, governors and gyroscopes. Students will also be exposed to the methods of balancing rotating masses and parts of a combustion engine. The concept of vibration with respect to one-degree-freedom is also studied. At the end of the course, the students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

SEMM 2313 - Mechanics of Fluids I

The principle aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behaviour and flow. It will emphasize on the concept of pressure, hydrostatic pressure equation and its application in the measurement of pressure, static force due to immersed surfaces, floatation and buoyancy analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduce specially to solve flow measurement, mass or volumetric flow rate, momentum in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate an ability to analyse whether statically, dynamically or kinematically problems related directly to fluids.

SEMM 2413 - Thermodynamics

Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle expressed in the First Law of Thermodynamics will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

SEMM 2613 - Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers and composites and their fundamental structures. The course will also provide basic diffusion

mechanisms, metal solidification phase diagrams and heat treatment processes. At the end of the course, students should be able to apply the knowledge of atomic bonding and crystal structures to predict the physical and mechanical behaviour of materials and use the principles of phase diagrams and heat treatments to the design of materials and their properties.

SEMM 2921 - Laboratory I

This course is introduced in the second year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It consists of six laboratories; Strengths of Materials Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluid Laboratory. Students will be grouped into 5 to 6 people for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3023 - Applied Numerical Methods

This course formally introduces the steps involved in engineering analysis (mathematical modelling, solving the governing equation, and interpretation of the results). Examples of case studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and partial differential equation are introduced.

SEMM 3242 - Instrumentation

The course shall cover the essential and basic theory of instrumentation for undergraduate. It shall cover the following: fundamentals and components of instrumentation system, characteristics of instrumentation system, signal conditioning and application of sensors in measurements.

SEMM 3623 - Materials Engineering

This course is designed to introduce students to the concept of fracture mechanics and how engineering materials respond to mechanical loads. The failure behaviour of engineering materials will cover fracture, fatigue, creep, wear and corrosion. The course will also provide students with knowledge of how to conduct failure analysis and determine the root cause of failure under different mechanical loading. The mechanical behaviour of polymeric materials, ceramics and composites will also be covered examples of case studies as well of selecting engineering materials for specific product designs.

SEMM 3931 - Laboratory II

This course is introduced in the third year of Mechanical Engineering programme involving two hours per week and experimental based courses. It consists of six laboratories; Strength of Materials Laboratory, Thermodynamics Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluids Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment

and will be evaluated based on this report.

SEMM 4902 - Engineering Professional Practice
This course introduces students to engineering ethics and an engineer's responsibilities towards safety, health and welfare of the public. It emphasizes on the engineer as a professional man, engineers & society, code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practice. The course will also introduce students to organize, in a group, a community service activity in a planned and structured manner. At the end of the course, students should be able to demonstrate and apply engineering professional ethics in their career as an engineer.

PROGRAMME CORE COURSE

SEMO 1503 - Ship Engineering Drawing
This course introduces students to the basic of ships and engineering drawing knowledge. It enables students to apply their skills and knowledge of engineering drawing to understand any design via geometric drawing, orthographic projection, isometric and production drawing. Meanwhile, in ship drawing parts, the student will be able to interpret a hull formation through lines plan drawing which consists of body, half breadth and sheer plan projection. Basic terminologies which related to naval architecture and ship drawing will be highlighted in this course.

SEMO 1332 - Naval Architecture I
In this course, students will continue to learn basic naval architecture knowledge. For this subject, students are exposed on how to use the ship particulars and lines plan data in calculating the hydrostatic particulars of a ship. Students are introduced to the methods of hydrostatics and stability calculations. Students are then introduced to design concept as they are required to use their naval architecture knowledge to design an object for floating structure design competition. The subject contents also include the introduction to ship general arrangement. The course includes hands-on individual and group projects

SEMO 1922 - Introduction to Naval Architecture and Offshore Engineering
The course comprises two parts intended to introduce students to the field of naval architecture and offshore engineering. The first part raises the students' awareness on the importance and necessity in developing systematic approach for solving naval architecture and offshore engineering problems. It introduces the importance of some generic skills to naval architects and offshore engineers. It also provides students an overview of the differentfields within naval architecture and offshore engineering and a description of the naval architects and offshore engineer's work and professional responsibilities. The second part aims to expose students to the hands-on nature of basic engineering workshop skills.

SEMO 2123 - Ship and Offshore Structure I
This course is concerned with the knowledge on loading and stresses of ship and offshore structure. It begins with the components and functions on ship and offshore structures. The floating hull loading, shear forces and bending moments are then in detail discussed. The important structural strength analysis for ship and offshore structures will be highlighted on

bending and buckling afterward.

SEMO 2713 - Ship & Offshore Production Technology

This course is essential as it prepare the student with the basic knowledge and exposure on construction process of ship & offshore structures. This course covers the hardware and software aspects of ship and offshore production technology. It begins with the introduction to shipbuilding industry, its importance and development in world economics and in Malaysia. Ship and offshore /production construction process flow chart and activities. Production/construction yards location, layout and facilities. Material treatment including surface preparation, cutting process, welding, painting process etc. that involve in the construction process. It followed by sub assembly, block assembly and erection process of offshore structures. Upon completion, Launching, transporting and upsetting process will also be discussed. On the soft engineering side, the quality control and production system will also be taught. Apart from normal lecture hours, the student is expected to carry out class assignment, field survey or site visits to ship and offshore production yards and technical writing. Therefore, the course is expected to develop and enhance the student ability to discuss and explain the related knowledge, to work in team effectively, long life learning and communication skills.

SEMO 2343 - Marine Hydrodynamics

This course starts with enhance the knowledge in fluid mechanic with discussion on the motion of Real fluid and Ideal fluid. Basic knowledge of marine hydrodynamics theory and general concept of numerical approach in simulate the flow around floating body are introduced in this course. Further discussions are also given in surface waves and various hydrodynamic problems. The hydrodynamic coefficients such as added mass coefficient, damping coefficient and wave loading are defined. Brief discussion is also given on the motion of floating body in regular wave by related to the hydrodynamic coefficients of the floating body.

SEMO 3133 - Ship and Offshore Structure II

This course is divided into three main areas, namely ship/platform topside vibration, finite element methods and underwater structural failure. In the vibration it starts with introduction to the structural vibration, free vibration and forced vibration. It is then followed by the vibration calculation in ships and platform topside structure. Method of determining vibration characteristics and reducing vibration are given for design practices. FEM covers the analysis of statically indeterminate structure by the direct stiffness method of truss, beam and plane frames. The students are also required to carry out building frame project using FEM software. In the underwater structural failure, it reviews the various modes of structural failure and highlights the importance of fracture induced failure and contrasts it with the limited coverage given to fracture mechanics in underwater. This section will discuss some examples of well-known failures/accidents attributed to cracking. Then, using a simple example we shall compare the failure load predicted from linear elastic fracture mechanics with the one predicted by classical strength of material. The ability to learn independently, working in team and interpret the results objectively will also be emphasized in this course.

SEMO 3033 - Computational Methods in Ocean Engineering

This course is designed to enhance the students' computational knowledge in simulating fluid flow and strength of floating structure. In the first half semester, the fundamental knowledge on computational fluid dynamic will be introduced to students. The course will enhance the basic knowledge that has been developed in the Marine Hydrodynamics and expose the students in analysing hydrodynamically the flow field. It will emphasize on the analysis and the importance of boundary layer, ideal and compressible flow in a practical engineering application. The course will also provide the knowledge on analysis of flow through marine vehicle and structure. In the second half semester, the course will be focused in the computational solution to analysis the strength of floating structure. It starts with discuss the external loading to the floating structure such as the effect of flow and wave to the stress on the floating structure. After that, the course gives students an exposure to the theoretical basis of the finite element method and its implementation principles. The students will be applied the finite element method to develop the governing equation and solve the equation for the giving simple engineering problem. Besides, this part of the course also introduces the use of general-purpose finite element software for solving real-life engineering problems. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to marine hydrodynamics.

SEMO 3333 - Naval Architecture II

This course introduces students to further naval architectural knowledge. It enables students to familiarise themselves with naval architectural terms ship components and undertakes hydrostatics and stability calculations. Students will be able to carry out calculations to determine ship stability in all conditions. The content covers calculation of areas, moments and centroids, transverse stability, longitudinal stability, large angle stability, damage stability and launching.

SEMO 3512 - Ship and Offshore Design

This course introduces the students to Ship and Offshore Design. It starts with the definition of design and spiral nature of ship design process. Four different stages of ship design will be discussed briefly but focusing more on basic ship design covering conceptual design and some of preliminary design stage. The contents of the course mainly cover the theory and governing principles used in basic ship design starting from understanding mission and owners requirement, followed by preliminary estimation of main dimensions, hull form properties and generation process, preliminary calculation of hydrostatics and stability and preliminary general arrangement of the ship. Some of the statutory requirements in design will also be discussed and finally method of estimating first cost of the ship will be introduced. Apart from the theoretical background, the student will also require carrying out hands on project (in group) to determine the main dimension and conceptual sketch of general arrangement of a ship based on the given design/owners' requirements. This will provide them with the initial exposure and experience of applying the knowledge learned in theory to solve the real problem given.

SEMO 3523 - Integrated Ship & Offshore Design Project I

Integrated Ship and Offshore Design Project consists of two Parts run in two consecutive semesters (6 & 7 Sem). This course is the first parts of the IDP that requiring the students to carry out several basic ship design tasks. It covers the Hull form development of the ship based on the design requirements and main dimensions of the ship, General Arrangement design & Capacity calculation and Hydrostatics calculation and Stability Assessment. The result of the design works of this course will be used for following design tasks in the following semesters. The students working in group of three are expected to propose the ships and its main systems that able to deliver the intended design requirements (problem). The design tasks and the quality of the solution should reflect the real design works in industry. In carrying out the design task effectively, the students are expected to apply and integrate the knowledge learnt in the core courses and acquiring new knowledge on their own in order to solve the design problem correctly. Hence the PoPBL (Project Oriented Problem Based Learning) approach is adopted in this course. Apart from technical knowledge and design skills, the students will also be exposed to several generic skills such as team working and leadership skills, communication skills, project management.

SEMO 3353 - Ship Resistance & Propulsion

This course introduces students to ship hydrodynamics, dimensional analysis, fundamentals of ship resistance, ship resistance and its components and methods of determining ship total resistance. The course then introduces the fundamentals of ship model testing and extrapolation methods to full scale ships. The course discusses various marine propulsors and specifically the marine propeller. The course also includes the description of propeller geometrical features and its effect on propeller performance. Propeller theories, methods of propeller design and the study of cavitation phenomena together with the analysis of propeller-engine matching also discussed

SEMO 3813 - Marine Transport & Economic

This course focuses on delivering knowledge to students on two aspects of maritime transport and economics. Firstly, is on the basic definitions and process for the efficient operation of global port and shipping operations. Secondly is on the basic definition for the economics of port and shipping operations up to the concepts for appraising investment and financial performance. Additional knowledge is also given to students on the current issues influencing the world maritime scenario. The topics selected are globalization, technology and knowledge while addressing environmental issues.

SEMO 3915 - Industrial Training

Industrial training exposes students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning which requires the students to learn the process and able to apply their knowledge acquired in class into actual industrial setting. The knowledge acquire during practical training may be used later in final year class as well as to equip them with sufficient knowledge for job interviews.

SEMO 4233 - Dynamics of Marine Vehicles

Marine vehicles and floating structures are built for transportation and to perform various marine activities such as fishing and offshore drilling. This course provides the knowledge of the characteristics of vessels/structures and the effect of the environment on their behaviour. The course begins with the introduction to effects of waves on vessels and structures. Since ocean waves are complex in nature, by incorporating linear wave theory, statistical methods can be adopted to study the irregular behaviour of waves and relate to vessels/structures motions characteristics. Some of the topics include; Introduction to seakeeping and solving seakeeping in waves using strip theory. Introduction to manoeuvrability of vessels that are motions in the horizontal plane so that they can proceed on a straight path, turn or take other avoiding actions in calm water as well as in waves, wind and current. This course emphasises on the student's ability to identify and solve the behaviour marine vehicles/structures problems by carrying the necessary calculation and analysis.

SEMO 4423 - Marine and Offshore Engineering System

The course covers the main engineering systems of the ship and offshore structure machinery. This includes the propulsion and auxiliary systems. Selected analyses of the thermodynamic processes of the system, description of the plant main components, operating principle and performances will be studied. This includes the marine diesel engine and steam turbine power plant, electric, drilling and hydraulic power system. Other important support system such as air conditioning, fire, condition and performance monitoring system will also be covered.

SEMO 4533 - Integrated Ship and Offshore Design II

This is the second part of Integrated Ship & Offshore Design Project, continuation from the first part SEMO 3513. The students working in the same group as in part I are expected to continue the ship design tasks by performing structural design and strength assessment and addressing the sustainability aspect of the design in order to complete most of the tasks in preliminary design process. The design work continues with the Offshore Structures design which could be chosen between Semi-Submersible, TLP, FPSO etc. depending on the availability of data. The design task focuses on structures configuration, Hydrostatics Calculation, Stability Assessment based on MODU, Seakeeping and Mooring Analysis and Structural Strength Assessment of the selected offshore structures. The design tasks and the quality of the solution should reflect the real design works in industry. In carrying out the design task effectively, the students are expected to apply and integrate the knowledge learnt in the core courses and acquiring new knowledge on their own in order to solve the design problem correctly. Hence the PoPBL (Project Oriented Problem Based Learning) approach is adopted in this course. Apart from technical knowledge and design skills, the students will also be exposed to several generic skills such as team working and leadership skills, communication skills and project management.

SEMO 4262 - Risers & Mooring Dynamics

This course provides the design and installation operations of riser and mooring systems. Emphasis is made on design of deep-water moorings and riser system by the accepted industry practices and design codes and criteria. It starts with the types and layout of risers, layout and geometry of mooring and line types. Then the riser and mooring line design cycle is introduced and in this section the students calculate the environmental loads, pretension

and static equilibrium, and vortex-induced-vibration (VIV), and analyse the static and dynamic performances including floater. The students also solve the dynamic performances of riser/mooring lines using simulation software (e.g. MOSES) and analyse the fatigue of riser and mooring chains.

SEMO 4823 - Engineering Management Environment & Safety

This course aims to prepare students with knowledge on basic principles of management, project management, marine environment and safety. The management part will examine key issues in management and organization, past management and today, strategic management, organizational structure and design, human resource management, motivating employees and leadership. Project management shall cover network analysis, resources constrained project, crash time and project performance and risk assessment. Main topics covered under environment and safety will be IMO, MARPOL, SOLAS and the like. OSHA 1994, Factories and Machinery Act 1967 shall also be mentioned. Safety topics cover hazard identification, risk assessment and control, basic principles of accident prevention and occupational health. At the end of the course, students should be able to describe fundamental aspects of management, integrate knowledge in engineering and management in making business decisions, apply the principles of hazard identification, risk assessment/ control, plan, design and implement an effective safety program.

SEMO 4912 - Undergraduate Project I

This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given a topic on a project student have to identify a problem, gather relevant information to the problem and propose solutions to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

SEMO 4924 - Undergraduate Project II

This course is the continuation of Undergraduate Project (UGP) I. It enhances the students' knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and the ability to plan and manage their work effectively. This course will also develop the students' capability to present, discuss and analyse results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

SEMO 4951 - Marine Laboratory

This course is designed to enable the students to apply knowledge of seakeeping & motions in waves, manoeuvring, offshore structure tests in the laboratory works. The students need to seek information and prepare marine model experiments protocol and procedure. This course will train the students to prepare the experimental set up and conduct the marine model experiments. They are instructed to analyse the experimental result and deduce the appropriate conclusion. The students need to adopt team work to solve seakeeping & motions, manoeuvring, and self-propulsion tests. This course also develops the students'

capability to present, discuss and analyse experimental results clearly, effectively and confidently in the oral presentations as well as in the written laboratory reports.

ELECTIVE COURSES:
Elective courses are offered to provide a wider area of study. Students can choose the courses according to their interest.

SEMO 4012 - Marine Meteorology and Oceanography
This course gives an introduction to the courses of oceanography and marine meteorology. It explains the fluid physical characteristics and movement on the earth surface. As such, the student will have a clear understanding of the weather which results from the interaction between the atmosphere and the sea surface.

SEMO 4132 - Marine Control Engineering
The course encompasses control engineering analysis and the vessel's auxiliary systems. This includes marine control engineering systems, hydraulic and electrical system. The students are expected to solve control engineering problems, analyse the performance and operation of marine control systems

SEMO 4142 - Reliability of Ship and Offshore Structures
This course provides reliability of ship and offshore structure as the complement of the failure probability for a rational measure of safety in structural design. The course applies the reliability method which deals with the uncertain nature of loads, resistance, etc. and leads to assessment of the reliability. The reliability method is based on analysis models for the structure in conjunction with available information about loads and resistances and their associated uncertainties. These are introduced to the analysis models that are usually imperfect, and the information about loads and resistances is usually incomplete. At the end of the course, students should be able to calculate the reliability as assessed by reliability method that is generally not a purely physical property of the structure but rather a nominal measure of safety of the structure given a certain analysis model and a certain amount and quality of information.

SEMO 4152 - Platform Pipeline and Sub-Sea-Technology
This course provides the concepts of offshore platform, submarine pipeline and subsea-technology, basic calculation on strength and fatigue, safety on fatigue life, reliability assessment, design issues, fabrication, installation and operations of offshore platform, submarine pipelines and risers, and also understanding of the equipment used in subsea developments.

SEMO 4452 - Marine Engineering System Project
Marine Engineering System Project is designed for final year students to perform marine systems design. Students are required to specifically design a typical marine engineering system for a chosen ship or offshore vehicles. Students are then required to integrate these systems together to form a workable compromise and fulfil the vessel's intended function. The students are expected to understand the design processes, operations and selection of the auxiliary systems. During the course of the subject students are required to have numerous

discussions and presentations to complete the design. Implementation of this course is via group project.

INTEGRATED BACHELOR-MASTER PROGRAMME (PRISMS) ELECTIVE COURSES

LIST of PRISMS ELECTIVE COURSES

1. **MASTER OF SCIENCE (MECHANICAL ENGINEERING)**
    - SEMM 5023 - Product Innovation and development
    - SEMM 5113 - Advanced Mechanics of Composite Structures
    - SEMM 5223 - Advanced Industrial Automation
    - SEMM 5273 - Vibration measurement and control
    - SEMM 5343 - Friction, wear and lubrication
    - SEMM 5413 - Energy Management
    - SEMB 5613 - Advanced Materials Processing
    - SEMB 5623 - Smart Materials
    - SEMB 5633 - Assets Integrity and Management
    - SEMB 5643 - Structural composites
    - SEMP 5713 - Statistical Quality Engineering
    - SEMP 5723 - Green Manufacturing Technology
    - SEMP 5733 - Digital Manufacturing
    - SEMV 5313 - Advanced Vehicle Dynamics
    - SEMV 5403 - Internal Combustion Engine & Boosting system
    - SEMV 5503 - Advanced Vehicle Powertrain

2. **MASTER OF SCIENCE (INDUSTRIAL ENGINEERING)**
    - SEMI 5813 - Statistical Quality Engineering
    - SEMI 5823 - Supply Chain and Logistics
    - SEMI 5833 - Work System and Ergonomics
    - SEMP 5713 - Statistical Quality Engineering
    - SEMP 5723 - Green Manufacturing Technology
    - SEMP 5733 - Digital Manufacturing

PRISMS ELECTIVE COURSE SYNOPSIS

MASTER OF SCIENCE (MECHANICAL ENGINEERING)

SEMM 5023 - Product Innovation and Development

This course introduces the students to the various stages of product design and development methods that can be put into immediate practice in developing products or projects. The development procedures blend the various perspective of marketing, design and manufacturing into a single approach to product development. Aspect of sustainable design and manufacturing will also be covered. The course also provide practice in carrying small project to expose the various stages of product development. It also includes the various prototyping and manufacturing systems strategies in developing product prototype.

SEMM5113 - Advanced Mechanics of Composite Materials

This course introduces students to some major views and theories in the area of composite materials especially in the polymer based composite learning with emphasis on the types of materials, production methods, failure analysis and the mechanics of laminated composites. It will examine some key issues in the mechanics of laminated composites with special focus on the stress-strain relationship and interaction to the extensional, coupling and bending stiffness matrices in promoting learning. Sandwich structures and interlaminar fracture toughness will also be included in this syllabus. The course will also provide a visit to industries dealing with polymer based composite materials in order the students to understand more regarding the practical sides of the subject.

SEMM 5223 - Advanced Industrial Automation

The course is an elective for students seeking a specialty in mechanical engineering. It shall introduce students to the methods, tools, and technologies used to automate a product or a plant. Primary automation technologies include sensors, actuators, signal conditioners, microprocessor/microcontroller, programmable logic controllers (PLCs), ON/OFF and automatic control, and PC-based control are covered within this course. Students will also experience development of automated product/plant through hardware programming and interfacing implementation.

SEMM 5273 - Vibration measurement and control

The course relates to practical aspects of vibration measurements and the control of vibration in mechanical and engineering systems. Cause and effects of vibration related failures are presented that highlight the importance of measurements, diagnosis, assessment and control of vibration in the industry. A review of vibration basics from a measurement perspective is presented. Important aspects of vibration data acquisition, signal processing and data interpretation are covered. Topics in vibration fault analysis, avoidance of vibration induced failures, and reduction of vibration and design of control solutions are covered. The course involves measurements and design exercises to demonstrate and to apply knowledge in vibration instrumentation and control.

SEMM 5343 - Friction, wear and lubrication

This course covers basic knowledge on tribological contact in mechanical systems in relative motion. The course presents the importance, role and properties of contact surfaces, materials and surroundings. Furthermore, the influence of the components of a tribological system and contact conditions on the properties of friction and tear is explained. The course covers the types and the role of lubricants, as well as their influence on the quality of lubrication, friction, and on various friction and wear mechanics. In relation to these topics, the analytical techniques available for the analysis of surface properties, lubricants, tribological behaviour and wider systems are presented.

SEMM 5413 - Energy Management

Energy management is meant for guiding energy-sector activities to conserve energy and enhance energy supply and security. Energy management includes four main functions: analysis of historical data, energy audit and accounting, engineering analysis of systems, and energy economics. This course covers contemporary energy management topics such as

energy sector challenges, energy policy and regulations, energy management system, energy audit, energy economics, and emerging energy technologies. This course also provides training in gathering updated energy related information to apply in real-life applications. The course is multidisciplinary in nature and students will be required to look at the energy sector problems from a holistic point of views. After successful completion of this course, the students would comprehend the energy management knowledge to play their role in conserving and efficient use of energy in building and industry.

SEMB 5613 - Advanced Materials Processing

This course introduces students to the manufacturing methods of materials engineering into the desired shapes. It starts with the basic concepts of manufacturing and processing and their applications to materials engineering as it introduces students to solidification in casting, powder metallurgy, deformation processes. The course will examine the various processing methods for metals, ceramics, polymers and composite materials, including joining and recycling processes for metals, polymer and ceramics. The course emphasis on the role played by materials and their properties in selecting the optimum manufacturing method. In addition to the advanced processes of traditional materials, the course also covers the advanced process for semiconductor materials and optical fibre, the thin film deposition process on nanoscale application, and Layer-Based Additive Manufacturing Technologies.

SEMB 5623 - Smart Materials

This course introduces students to the recent developments on the various classes of smart materials or functional materials used in applications such as aerospace, automotive, biomedical and electronic industries. It will emphasize on the important properties exhibited by smart materials that make them selected for high-end and advanced applications. The physical and mechanical properties of the various classes of smart materials will be detailed as well as the unique processing techniques associated with producing these materials. The course will also cover shape memory alloys, self-healing materials, materials for sensor and actuator, and sustainable materials. The students are enabled to describe structural setup and function of advanced and functional materials. They command modern synthesis techniques and are able to apply these techniques to the preparation of new compounds. The students can interpret and evaluate the results of various methods for structural analysis of functional materials and apply the knowledge to select suitable materials for a given engineering project.

SEMB 5633 - Asset Integrity and Management

This course is introducing the students to the Asset Integrity Management (AIM) system especially for an aging offshore oil field infrastructure. The platforms, pipelines and onshore facilities were aged and needed some extensive refurbishment and a new inspection and integrity regime put in place. The course also provides a comprehensive coverage of the various non-destructure techniques (NDT) used to assess the intergrity of engineering components. The concepts and techniques used in assessing assets through risk based assessement (RBI) be covered.

SEMB 5643 - Structural Composites

Advanced composite materials are used in many industries including aerospace, marine, automotive, medical, energy, and recreation. Striking examples of the expanding use of composites are the Boeing 787 and Airbus A350, as these materials improve performance and save weight. To better prepare engineers in applying these new material technologies to the design and manufacturing of composite structures. This subject provides an introduction to structural composites, starting with the "trinity" - the interaction between shape design, base material and manufacturing. The course covers the design principles of composites structure; durability and fatigue; testing; manufacturing methods and mechanics. The main focus is on composites structures made with polymer matrices but use of metals and ceramics as matrices will be addressed as well. By the end of this course students will be able to know what design choices they have to make for different requirements. Also, the student will be able to identify the unique characteristics of composites and apply the fundamental and practical knowledge necessary to build and maintain composite structures.

SEMP 5713 - Statistical Quality Engineering

This course is designed to provide the students with sound understanding to statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. For control charts, emphasis was given on additional control charts not covered previously at the undergraduate level. Advanced tools and techniques such as Gauge Repeatability and Reproducibility (GR & R), Quality Function Deployment (QFD), Failure Mode Effect Analysis (FMEA) and experimental design methodology were also covered.

SEMP 5723 - Green Manufacturing Technology

This course introduces students to green manufacturing technology and sustainability considerations in product design and manufacture. It is present the principles, methodology and case studies to develop an understanding of sustainable development that can reduce environmental impact and promote green technology for sustainable practice. Besides that, it is also introducing the Life Cycle Assessment consists of four main phases, goal and scope definition, inventory, impact assessment, and interpretation. Analysis of use valid life cycle assessment method to collect and process data of the product's life cycle orthe manufacturing processes consumption or declaring the total emissions from the manufacturing.

SEMP 5733 - Digital Manufacturing

This course aims to prepare students with one of the pillar knowledge under industrial 4.0 industrial revolutions. Digital Manufacturing (DM), also known as 3D Printing Technology, is a group of manufacturing technologies that involves part creation by joining material together without part-specific tooling, driven by a computer. The technologies focus on prototypes and low-technology applications, DM service parts are being used in safety-critical fields including aerospace, automotive, biomedical, and services industries. The purpose of this course is to provide participants with knowledge and tools for informed decision making relative to integration of DM processes and parts into the industrial application. The coverage includes current DM practice for metals, polymers and ceramics; mechanical properties; DM processing for production; and application inroads into industrial applications. At the end of the course, students should be able to describe fundamental aspects of Additive Manufacturing/3D

Printing Technology techniques and their application; finally, also perform engineering analysis to solve product manufacture problems and evaluate engineering investment/projects by utilised this technique.

SEMV 5313 - Advanced Vehicle Dynamics

This course discusses vehicle dynamics in general which covers the vehicle's ride and handling behaviours. The systems which contribute to a better vehicle dynamic performance in modern passenger vehicle will be covered in this course. This includes the semi-active and active suspension systems, roll control systems, electronic brake force distribution (EBD) system, anti-lock braking system (ABS) and active steering system. The importance of vehicle dynamics for automated vehicle will also be covered in this course. This includes handling modelling and control system of an automated vehicle which utilises sensors data to maneuver. All of the mentioned systems will be introduced theoretically followed by the development of the systems' simulation model using MATLAB/SIMULINK. At the end of the course, the students are able to develop modern vehicle dynamics'-controlled systems which are typically used for an outstanding dynamics performance for a vehicle.

SEMV 5403 - Internal Combustion Engine & Boosting Systems

This course is designed to deliver the principles of internal combustion engine and boosting systems. The subject covers the types of internal combustion engines and its operations. Furthermore, the latest technologies that make internal combustion engine to be more efficient and less polluting are also covered in this subject. Additionally, the course emphasizes on the engine air induction system, in particular the turbocharging and supercharging methods. It covers the science governing the operation of turbochargers and superchargers – which include aerodynamics, gas dynamics and thermodynamics. Upon completion of this course, students will have advanced understanding of how internal combustion engine with boosting system can meet the strict emission and energy efficiency targets.

SEMV 5503 - Advanced Vehicle Powertrain

This course covers principle knowledge of conventional and alternative powertrain systems for automotive applications. It includes main components in the powertrain systems namely powerplant (internal combustion engine/electric motor), transmissions and power storage (battery). At the end of the course, students should be able to propose powertrain system for passenger vehicles.

MASTER OF SCIENCE (INDUSTRIAL ENGINEERING)

SEMI 5813 - Statistical Quality Engineering

This course is designed to provide the students with sound understanding to statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. For control charts, emphasis was given on additional control charts not covered previously at the undergraduate level. Advanced tools and techniques such as Gauge Repeatability and Reproducibility (GR & R), Quality Function Deployment (QFD), Failure Mode Effect Analysis (FMEA) and experimental design methodology were also covered.

SEMI 5823 - Supply Chain and Logistics

This course is identifying strategic importance of good supply chain and logistics design and management on the competitive position for each supply chain members. The main goal of this course is to understand the fundamental of supply chain and logistics including logistics vs supply chain, supply chain drivers, metrics and performance, distribution and network designs, 3PL, 4PL, transportation, procurement and sourcing and the logistics and supply chain in the future in order to satisfy end customers. This course also concerns about techniques for designing transportation networks, distribution issues, logistics management, integration issues and performance measurement.

SEMI 5833 - Work System and Ergonomics

This subject aims to provide students with fundamental knowledge of ergonomics (also known as human factors engineering) relevant for industry. This includes fundamental concepts and analysis of industrial problems in ergonomics such as practice of ergonomics principles and methodology, solving industrial problems related to ergonomics, information input and design, human physical work capacity, job design and task analysis including Ergonomics Risk Assessment (ERA).